GAS AND OIL
IN
FOREIGN COUNTRIES

23 - PART 1

SPECIAL CONSULAR REPORTS.

GAS AND OIL ENGINES

IN

FOREIGN COUNTRIES.

VOL. XXIII—PART I.

REPORTS FROM THE CONSULS OF THE UNITED STATES IN ANSWER
TO INSTRUCTIONS FROM THE DEPARTMENT OF STATE.

Issued from the Bureau of Foreign Commerce,
Department of State.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1901.

PUBLICATIONS OF THE BUREAU OF FOREIGN COMMERCE.[1]

The publications of the Bureau of Foreign Commerce, Department of State, are:

I.—COMMERCIAL RELATIONS, being the annual reports of consular officers on the commerce, industries, navigation, etc., of their districts.

II.—CONSULAR REPORTS, issued monthly, and containing miscellaneous reports from diplomatic and consular officers.

III.—ADVANCE SHEETS, CONSULAR REPORTS, issued daily, except Sundays and legal holidays, for the convenience of the newspaper press, commercial and manufacturing organizations, etc.

IV.—EXPORTS DECLARED FOR THE UNITED STATES, issued quarterly, and containing the declared values of exports from the various consular districts to the United States for the preceding three months.

V.—SPECIAL CONSULAR REPORTS, containing series of reports from consular officers on particular subjects, made in pursuance to instructions from the Department.

Following are the special publications issued by the Bureau prior to 1890:

Labor in Europe, 1878, one volume; Labor in Foreign Countries, 1884, three volumes; Commerce of the World and the Share of the United States Therein, 1879; Commerce of the World and the Share of the United States Therein, 1880–81; Declared Exports for the United States, First and Second Quarters, 1883; Declared Exports for the United States, Third and Fourth Quarters, 1883; Cholera in Europe in 1884, 1885; Trade Guilds of Europe, 1885; The Licorice Plant, 1885; Forestry in Europe, 1887; Emigration and Immigration, 1885–86 (a portion of this work was published as CONSULAR REPORTS No. 76, for the month of April, 1887); Rice Pounding in Europe, 1887; Sugar of Milk, 1887; Wool Scouring in Belgium, 1897; Cattle and Dairy Farming in Foreign Countries, 1888 (issued first in one volume, afterwards in two volumes); Technical Education in Europe, 1888; Tariffs of Central America and the British West Indies, 1890.

The editions of all these publications, except Tariffs of Central America, etc., are exhausted, and the Department is therefore unable to supply copies.

In 1890 the Department decided to publish reports on special subjects in separate form, to be entitled SPECIAL CONSULAR REPORTS. There are now the following SPECIAL CONSULAR REPORTS:

Vol. 1 (1890).—Cotton Textiles in Foreign Countries; Files in Spanish America; Carpet Manufacture in Foreign Countries; Malt and Beer in Spanish America, and Fruit Culture in Foreign Countries.

Vol. 2 (1890 and 1891).—Refrigerators and Food Preservation in Foreign Countries; European Emigration; Olive Culture in the Alpes Maritimes, and Beet-Sugar Industry and Flax Cultivation in Foreign Countries.

Vol. 3 (1891).—Streets and Highways in Foreign Countries. (New edition, 1897.)

Vol. 4 (1891).—Port Regulations in Foreign Countries.

Vol. 5 (1891).—Canals and Irrigation in Foreign Countries. (New edition, 1898.)

Vol. 6 (1891 and 1892).—Coal and Coal Consumption in Spanish America; Gas in Foreign Countries, and India Rubber.

Vol. 7 (1892).—The Stave Trade in Foreign Countries and Tariffs of Foreign Countries.

Vol. 8 (1892).—Fire and Building Regulations in Foreign Countries.

Vol. 9 (1892 and 1893).—Australian Sheep and Wool, and Vagrancy and Public Charities in Foreign Countries.

Vol. 10 (1894).—Lead and Zinc Mining in Foreign Countries, and Extension of Markets for American Flour. (New edition, 1897.)

Vol. 11 (1894).—American Lumber in Foreign Markets. (New edition, 1897.)

Vol. 12 (1895).—Highways of Commerce. (New edition, 1899.)

Vol. 13 (1896 and 1897).—Money and Prices in Foreign Countries.

Vol. 14 (1898).—The Drug Trade in Foreign Countries.

Vol. 15 (1898).—Part I. Soap Trade in Foreign Countries; Screws, Nuts, and Bolts in Foreign Countries; Argols in Europe; Rabbits and Rabbit Furs in Europe, and Cultivation of Ramie in Foreign Countries. Part II. Sericulture and Silk Reeling and Cultivation of the English Walnut.

Vol. 16 (1899).—Tariffs of Foreign Countries. Part I. Europe. Part II. America. Part III. Asia. Part IV. Africa. Part V. Australasia and Polynesia. (Parts III, IV, and V not yet published.)

Vol. 17 (1899).—Disposal of Sewage and Garbage in Foreign Countries; Foreign Trade in Coal Tar and By-Products.

Vol. 18 (1900).—Merchant Marine of Foreign Countries.

Vol. 19 (1900).—Paper in Foreign Countries, and Uses of Wood Pulp.

Vol. 20 (1900).—Part I. Book Cloth in Foreign Countries; Market for Ready-Made Clothing in Latin America; Foreign Imports of American Tobacco; Cigar and Cigarette Industry in Latin America. Part II. School Gardens in Europe. Part III. The Stave Trade in Foreign Countries.

Vol. 21 (1900).—Part I. Foreign Markets for American Coal. Part II. Vehicle Industry in Europe. Part III. Trusts and Trade Combinations in Europe.

Vol. 22 (1900 and 1901).—Part I. Acetic Acid in Foreign Countries. Part II. Mineral Water Industry. Part III. Foreign Trade in Heating and Cooking Stoves.

Vol. 23 (1901).—Part I. Gas and Oil Engines in Foreign Countries.

Of these SPECIAL CONSULAR REPORTS, Australian Sheep and Wool, Cotton Textiles in Foreign Countries, Files in Spanish America, Fire and Building Regulations, Gas in Foreign Countries, India Rubber, Lead and Zinc Mining, Malt and Beer in Spanish America, Port Regulations, Refrigerators and Food Preservation, School Gardens, Sericulture, etc.; Vagrancy, etc., are exhausted, and no copies can be supplied by the Department.

There was also published, in 1899, Proclamations and Decrees during the War with Spain, comprising neutrality circulars issued by foreign countries, proclamations by the President, orders of the War and Navy Departments, and war decrees of Spain.

Of the monthly CONSULAR REPORTS, many numbers are exhausted or so reduced that the Department is unable to accede to requests for copies. Of the publications of the Bureau available for distribution, copies are mailed to applicants without charge. In view of the scarcity of certain numbers, the Bureau will be grateful for the return of any copies of the monthly or special reports which recipients do not care to retain. Upon notification of willingness to return such copies, the Department will forward franking labels to be used in lieu of postage in the United States, Canada, the Hawaiian Islands, and Mexico.

Persons receiving CONSULAR REPORTS regularly, who change their addresses, should give the old as well as the new address in notifying the Bureau of the fact.

In order to prevent confusion with other Department bureaus, all communications relating to Consular Reports should be carefully addressed, "Chief, Bureau of Foreign Commerce, Department of State, Washington, U. S. A."

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[1] Formerly Bureau of Statistics. Name changed to Bureau of Foreign Commerce by order of the Secretary of State, July 1, 1897.

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CONTENTS.

DEPARTMENT CIRCULAR.

DEPARTMENT OF STATE,
Washington, July 27, 1900.

To the consular officers of the United States.

GENTLEMEN: The editor of the Gas Engine, a monthly journal published in Cincinnati, has requested the Department, in behalf of some three hundred manufacturers, to secure, through your good offices, such information as may be obtainable concerning the use of gas engines in foreign countries, viz:

1. Whether gas engines are in use in your respective districts, and to what extent; the prevailing prices; the source of supply; if imported, how and whence; if not in use in your districts, the possibility of their profitable introduction and the best means by which they can be so introduced.

2. Fuels available in your respective districts and the prices therein of gasoline, kerosene, crude oils, or distillates; also, cost of coal or other fuel suitable for steam boilers.

3. Facilities for transportation of machinery from the United States to your respective districts, including freight rates and customs duties.

Bearing in mind the primary motive of this inquiry, your replies hereto will embrace such other points of information as will enable our manufacturers of gas engines to reach conclusions as to their ability to enter your respective districts with their machines and win a fair share of trade therein.

Your replies will be published in the Consular Reports.

I am, gentlemen, your obedient servant,

THOS. W. CRIDLER,
Third Assistant Secretary.

VALUES OF FOREIGN COINS AND CURRENCIES.

The following statements show the valuation of foreign coins, as given by the Director of the United States Mint and published by the Secretary of the Treasury, in compliance with the first section of the act of March 3, 1873, viz: "That the value of foreign coins, as expressed in the money of account of the United States, shall be that of the pure metal of such coin of standard value," and that "the value of the standard coins in circulation of the various nations of the world shall be estimated annually by the Director of the Mint, and be proclaimed on the 1st day of January by the Secretary of the Treasury."

In compliance with the foregoing provisions of law, annual statements were issued by the Treasury Department, beginning with that issued on January 1, 1874, and ending with that issued on January 1, 1890. Since that date, in compliance with the act of October 1, 1890, these valuation statements have been issued quarterly, beginning with the statement issued on January 1, 1891.

The fact that the market exchange value of foreign coins differs in many instances from that given by the United States Treasury has been repeatedly called to the attention of the Bureau of Foreign Commerce. An explanation of the basis of the quarterly valuations was asked from the United States Director of the Mint, and under date of February 7, 1898, Mr. R. E. Preston made the following statement:

"When a country has the single gold standard, the value of its standard coins is estimated to be that of the number of grains fine of gold in them, 480 grains being reckoned equivalent to $20.67 in United States gold, and a smaller number of grains in proportion. When a country has the double standard, but keeps its full legal-tender silver coins at par with gold, the coins of both gold and silver are calculated on the basis of the gold value.

"The value of the standard coins of countries with the single silver standard is calculated to be that of the average market value of the pure metal they contained during the three months preceding the date of the proclamation of their value in United States gold by the Secretary of the Treasury. The value of the gold coins of silver-standard countries is calculated at that of the pure gold they contain, just as if they had the single gold standard."

"These valuations are used in estimating the values of all foreign merchandise exported to the United States."

The following statements, running from January 1, 1874, to January 1, 1901, have been prepared to assist in computing the values in American money of the trade, prices, values, wages, etc., of and in foreign countries, as given in consular and other reports. The series of years are given so that computations may be made for each year in the proper money values of such year. In hurried computations the reductions of foreign currencies into American currency, no matter for how many years, are too often made on the bases of latest valuations. All computations of values, trade, wages, prices, etc., of and in the "fluctuating-currency countries" should be made in the values of their currencies in each year up to and including 1896, and in the quarterly valuations thereafter.

To meet typographical requirements, the quotations for the years 1875–1877, 1879–1882, and 1884–1887 are omitted, these years being selected as showing the least fluctuations when compared with years immediately preceding and following.

To save unnecessary repetition, the estimates of valuations are divided into three classes, viz, (A) countries with fixed currencies, (B) countries with fluctuating currencies, and (C) quarterly valuations of fluctuating currencies.

A.—*Countries with fixed currencies.*

The following official (United States Treasury) valuations of foreign coins do not include "rates of exchange."

Countries.	Standard.	Monetary unit.	Value in United States gold.	Coins.
Argentine Republic	Gold and silver	Peso	$0.96,5	Gold—argentine ($4.82,4) and $\frac{1}{5}$ argentine; silver—peso and divisions.
Austria-Hungary[1]	Gold	Crown	.20,3	Gold—20 crowns ($4.05,2) and 10 crowns.
Belgium	Gold and silver	Franc	.19,3	Gold—10 and 20 franc pieces; silver—5 francs.
Brazil	Gold	Milreis	.54,6	Gold—5, 10, and 20 milreis; silver—$\frac{1}{2}$, 1, and 2 milreis.
British North America (except Newfoundland).	do	Dollar	1.00	
British Honduras	do	do	1.00	
Chile	do	Peso	.36,5	Gold—escudo ($1.25), doubloon ($3.65), and condor ($7.30); silver—peso and divisions.
Costa Rica	do	Colon	.46,5	Gold—2, 5, 10, and 20 colons; silver—5, 10, 25, and 50 centisimos.
Cuba	Gold and silver	Peso	.92,6	Gold—doubloon ($5.01,7); silver—peso (60 cents).
Denmark	Gold	Crown	.26,8	Gold—10 and 20 crowns.
Egypt	do	Pound (100 piasters).	4.94,3	Gold—10, 20, 50, and 100 piasters; silver—1, 2, 10, and 20 piasters.
Finland	do	Mark	.19,3	Gold—10 and 20 marks ($1.93 and $3.85,9).
France	Gold and silver	Franc	.19,3	Gold—5, 10, 20, 50, and 100 francs; silver—5 francs.
Germany	Gold	Mark	.23,8	Gold—5 10, and 20 marks.
Great Britain	do	Pound sterling	4.86,$\frac{6}{4}$	Gold—sovereign (pound sterling) and half sovereign.
Greece	Gold and silver	Drachma	.19,3	Gold—5, 10, 20, 50, and 100 drachmas; silver—5 drachmas.
Haiti	do	Gourde	.96,5	Silver—gourde.
India[2]	Gold	Rupee	.32,4	Gold—sovereign ($4.8665); silver—rupee and divisions.
Italy	Gold and silver	Lira	.19,3	Gold—5, 10, 20, 50, and 100 lire; silver—5 lire.
Japan[3]	Gold	Yen	.49,8	Gold—1, 2, 5, 10, and 20 yen.
Liberia	do	Dollar	1.00	
Netherlands	Gold and silver	Florin	.40,2	Gold—10 florins; silver—$\frac{1}{2}$, 1, and $2\frac{1}{2}$ florins.
Newfoundland	Gold	Dollar	1.01,4	Gold—$2 ($2.02,7).
Peru[4]	do	Sol	.48,7	Gold—libra ($4.8665); silver—sol and divisions.
Portugal	do	Milreis	1.08	Gold—1, 2, 5, and 10 milreis.
Russia[5]	do	Ruble	.51,5	Gold—imperial ($7.718) and $\frac{1}{2}$ imperial ($3.80); silver—$\frac{1}{4}$, $\frac{1}{2}$, and 1 ruble.
Spain	Gold and silver	Peseta	.19,3	Gold—25 pesetas; silver—5 pesetas.
Sweden and Norway	Gold	Crown	.26,8	Gold—10 and 20 crowns.
Switzerland	Gold and silver	Franc	.19,3	Gold—5, 10, 20, 50, and 100 francs; silver—5 francs.
Turkey	Gold	Piaster	.04,4	Gold—25, 50, 100, 200, and 500 piasters.
Uruguay	do	Peso	1.03,4	Gold—peso; silver—peso and divisions.
Venezuela	Gold and silver	Bolivar	.19,3	Gold—5, 10, 20, 50, and 100 bolivars; silver—5 bolivars.

[1] The gold standard went into effect Jan. 1, 1900. (See Commercial Relations, 1899, Vol. II, p. 7.) Values are still sometimes expressed in the florin, which is worth 2 crowns.
[2] For an account of the adoption of the gold standard see Consular Reports, No. 238, p. 359.
[3] Gold standard adopted October 1, 1897. (See Consular Reports, No. 201, p. 259.)
[4] Gold standard adopted October 13, 1900.
[5] For an account of the adoption of the gold standard, see Review of the World's Commerce, 1896-97, p. 254.

B.—*Countries with fluctuating currencies, 1874–1896.*

Countries.	Standard.	Monetary unit.	Value in terms of the United States gold dollar on January 1—					
			1874.	1878.	1883.	1888.	1889.	1890.
Austria-Hungary[1]	Silver	Florin	$0.47,6	$0.45,3	$0.40,1	$0.34,5	$0.33,6	$0.42
Bolivia	do	Dollar until 1880; boliviano thereafter.	.96,5	.96,5	.81,2	.69,9	.68	.85
Central America	do	Peso	.96,5	.91,8	.....	.69,9	.68	.85
China	do	Haikwan tael	1.61	.....	.....	.....	.....	.....
Colombia	do	Peso	.96,5	.96,5	.81,2	.69,9	.68	.85
Ecuador	do	do	.96,5	.91,8	.81,2	.69,9	.68	.85
Egypt[2]	Gold	Pound (100 piasters).	.....	4.97,4	4.90	4.94,3	.....	.....
India	Silver	Rupee	.45,8	.43,6	.38,6	.32,2	.32,3	.40,4
Japan	Gold	Yen	.99,7	.99,7	.....	.99,7	.99,7	.99,7
	Silver		.....	.....	.87,6	.75,3	.73,4	.91,7
Mexico	do	Dollar	1.04,7½	.99,8	.88,2	.75,9	.73,9	.92,3
Netherlands[3]	Gold and silver.	Florin	.40,5	.38,5	.....	.....	.....	.....
Peru	Silver	Sol	.92,5	.91,8	.81,2	.69,9	.68	.85
Russia	do	Ruble	.77,17	.73,4	.65	.55,9	.54,4	.68
Tripoli	do	Mahbub of 20 piasters.	.87,09	.82,9	.73,3	.63	.61,4	.76,7

Countries.	Standard.	Monetary unit.	Value in terms of the United States gold dollar on January 1—					
			1891.	1892.	1893.	1894.	1895.	1896.
Austria-Hungary[1]	Silver	Florin	$0.38,1	$0.34,1	.....	.....	.....	.....
Bolivia	do	Boliviano	.77,1	.69,1	$0.61,3	$0.51,6	$0.45,5	$0.49,1
Central America	do	Peso	.77,1	.69,1	.61,3	.51,6	.45,5	.49,1
Colombia	do	do	.77,1	.69,1	.61,3	.51,6	.45,5	.49,1
Ecuador	do	do	.77,1	.69,1	.61,3	.51,6	.45,5	.49,1
India	do	Rupee	.36,6	.32,8	.29,2	.24,5	.21,6	.23,3
Japan	do	Yen	.83,1	.74,5	.66,1	.55,6	.49,1	.52,9
Mexico	do	Dollar	.83,7	.75	.66,6	.56	.49,5	.53,3
Peru	do	Sol	.77,1	.69,1	.61,3	.51,6	.45,5	.49,1
Russia	do	Ruble	.61,7	.55,3	.49,1	.41,3	.36,4	.39,3
Tripoli	do	Mahbub of 20 piasters.	.69,5	.62,3	.55,3	.46,5	.41,1	.44,3

[1] The silver standard prevailed in Austria-Hungary up to 1892. The law of August 2 of that year (see Consular Reports, No. 147, p. 623) established the gold standard.
[2] The Egyptian pound became fixed in value at $4.94,3 in 1887.
[3] The Netherlands florin fluctuated up to the year 1880, when it became fixed at 40.2 cents.

C.—*Quarterly valuations of fluctuating currencies.*

Countries.	Monetary unit.	1898.				1899.			
		Jan. 1.	Apr. 1.	July 1.	Oct. 1.	Jan. 1.	Apr. 1.	July 1.	Oct. 1.
Bolivia	Silver boliviano	$0.42,4	$0.40,9	$0.41,8	$0.43,6	$0.43,9	$0.43,4	$0.44,3	$0.43,6
Central America.	Silver peso	.41,4	.40,9	.41,8	.43,6	.43,9	.43,4	.44,3	.43,6
China	Amoy tael	.68,5	.66,2	.67,6	.70,6	.71	.70,2	.71,6	.70,5
	Canton tael	.68,3	.66	.67,4	.70,4	.70,8	.70	.71,4	.70,3
	Chefoo tael	.65,5	.63,3	.64,6	.67,5	.67,9	.67,2	.68,4	.67,4
	Chinkiang tael	.66,9	.64,6	.66	.69	.69,3	.68,6	.69,9	.68,9
	Fuchau tael	.63,4	.61,2	.62,5	.65,3	.65,6	.65	.66,2	.65,2
	Haikwan tael	.69,7	.67,3	.68,8	.71,8	.72,2	.71,4	.72,8	.71,8
	Hankau tael	.64,1	.61,9	.63,2	.66	.66,4	.65,7	.67	.66
	Hongkong tael	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]
	Ningpo tael	.64,3	.63	.65	.67,9	.68,2	.67,5	.68,8	.67,8
	Niuchwang tael	.65,9	.62	.63,4	.66,2	.66,5	.65,9	.67,1	.66,1
	Shanghai tael	.62,6	.60,4	.61,7	.64,5	.64,8	.64,1	.65,4	.64,4
	Swatow tael	.63,3	.61,1	.62,4	.65,2	.65,5	.64,9	.66,1	.65,1
	Takao tael	.66	.66,6	.68	.71	.71,4	.70,7	.72	.71
	Tientsin tael	.66,4	.64,1	.65,5	.68,4	.68,8	.68	.69,4	.68,3
Colombia	Silver peso	.42,4	.40,9	.41,8	.43,6	.43,9	.43,4	.44,3	.43,6
Ecuador	do	.42,4	.40,9	.41,8	.43,6	.43,9	.43,4	.44,3	.43,6
India	Silver rupee[2]	.20,1	.19,1	.19,9	.20,7	.20,8	.20,6	.21	.20,7
Mexico	Silver dollar	.46	.44,4	.45,4	.47,4	.47,7	.47,2	.48,1	.47,4
Persia	Silver kran	.07,8	.07,5	.07,7	.08	.08,1	.08	.08,2	.08
Peru	Silver sol	.42,4	.40.9	.41,8	.43,6	.43,9	.43,4	.44,3	.43,6

Countries.	Monetary unit.	1900.				1901.
		Jan. 1.	Apr. 1.	July 1.	Oct. 1.	Jan. 1.
Bolivia	Silver boliviano	$0.42,7	$0.43,6	$0.43,8	$0.45,1	$0.46,8
Central America	Silver peso	.42,7	.43,6	.43,8	.45,1	.46,5
China	Amoy tael	.69,1	.70,5	.70,9	.72,9	.75,7
	Canton tael	.68,9	.70,3	.70,7	.72,7	.75,5
	Chefoo tael	.66,1	.67,4	.67,8	.69,7	.72,4
	Chinkiang tael	.67,5	.68,8	.69,3	.71,2	.74
	Fuchau tael	.64	.65,2	.65,6	.67,4	.70,1
	Haikwan tael	.70,3	.71,7	.72,1	.74,2	.77,1
	Hankau tael	.64,7	.65,9	.66,3	.68,2	.70,9
	Hongkong tael	[1]	[1]	[1]	[1]	[1]
	Ningpo tael	.66,5	.67,7	.68,2	.70,1	.72,8
	Niuchwang tael	.64,8	.66,1	.66,5	.68,4	.71
	Shanghai tael	.63,1	.64,4	.64,8	.66,6	.69,2
	Swatow tael	.63,9	.65,1	.65,5	.67,4	.70
	Takao tael	.69,6	.70,9	.71,4	.73,4	.76,2
	Tientsin tael	.67	.68,3	.68,7	.70,7	.73,4
Colombia	Silver peso	.42,7	.43,6	.43,8	.45,1	.46,8
Ecuador	do	.42,7	.43,6	.43,8	.45,1	.46,8
India	Silver rupee[2]	.20,3	.20,7	.20,8	.....	.....
Mexico	Silver dollar	.46,4	.47,3	.47,6	.49	.50,9
Persia	Silver kran	.07,9	.08	.08,1	.08,3	.08,6
Peru	Silver sol	.42,7	.43,6	.43,8	.48,7	.....

[1] The British dollar has the same legal value as the Mexican dollar in Hongkong, the Straits Settlements, and Labuan.

[2] The sovereign is the standard coin of India, but the rupee is the money of account.

FOREIGN WEIGHTS AND MEASURES.

The following table embraces only such weights and measures as are given from time to time in Consular Reports and in Commercial Relations:

Foreign weights and measures, with American equivalents.

Denominations.	Where used.	American equivalents.
Almude	Portugal	4.422 gallons.
Ardeb	Egypt	7.6907 bushels.
Are	Metric	0.02471 acre.
Arobe	Paraguay	25 pounds.
Arratel or libra	Portugal	1.011 pounds.
Arroba (dry)	Argentine Republic	25.3175 pounds.
Do	Brazil	32.38 pounds.
Do	Cuba	25.3664 pounds.
Do	Portugal	32.38 pounds.
Do	Spain	25.36 pounds.
Do	Venezuela	25.4024 pounds.
Arroba (liquid)	Cuba, Spain, and Venezuela	4.263 gallons.
Arshine	Russia	28 inches.
Arshine (square)	do	5.44 square feet.
Artel	Morocco	1.12 pounds.
Barril	Argentine Republic and Mexico	20.0787 gallons.
Barrel	Malta (customs)	11.4 gallons.
Do	Spain (raisins)	100 pounds.
Berkovets	Russia	361.12 pounds.
Bongkal	India	832 grains.
Bouw	Sumatra	7,096.5 square meters.
Bu	Japan	0.1 inch.
Butt (wine)	Spain	140 gallons.
Caffiso	Malta	5.4 gallons.
Candy	India (Bombay)	529 pounds.
Do	India (Madras)	500 pounds.
Cantar	Morocco	113 pounds.
Do	Syria (Damascus)	575 pounds.
Do	Turkey	124.7036 pounds.
Cantaro (cantar)	Malta	175 pounds.
Carga	Mexico and Salvador	300 pounds.
Catty	China	1.333⅓ (1⅓) pounds.
Do[1]	Japan	1.31 pounds.
Do	Java, Siam, and Malacca	1.35 pounds.
Do	Sumatra	2.12 pounds.
Centaro	Central America	4.2631 gallons.
Centner	Bremen and Brunswick	117.5 pounds.
Do	Darmstadt	110.24 pounds.
Do	Denmark and Norway	110.11 pounds.
Do	Nuremberg	112.43 pounds.
Do	Prussia	113.44 pounds.
Do	Sweden	93.7 pounds.
Do	Vienna	123.5 pounds.
Do	Zollverein	110.24 pounds.
Do	Double or metric	220.46 pounds.
Chih	China	14 inches.
Coyan	Sarawak	3.098 pounds.
Do	Siam (Koyan)	2.667 pounds.
Cuadra	Argentine Republic	4.2 acres.
Do	Paraguay	78.9 yards.
Do	Paraguay (square)	8.077 square feet.
Do	Uruguay	Nearly 2 acres.
Cubic meter	Metric	35.3 cubic feet.
Cwt. (hundredweight)	British	112 pounds.
Dessiatine	Russia	2.6997 acres.
Do	Spain	1.599 bushels.
Drachme	Greece	Half ounce.
Egyptian weights and measures	(See Consular Reports, No. 144.)	

[1] More frequently called "Kin." Among merchants in the treaty ports it equals 1.33⅓ pounds avoirdupois.

Foreign weights and measures, with American equivalents—Continued.

Denominations.	Where used.	American equivalents.
Fanega (dry)	Central America	1.5745 bushels.
Do	Chile	2.575 bushels.
Do	Cuba	1.599 bushels.
Do	Mexico	1.54728 bushels.
Do	Morocco	Strike fanega, 70 lbs.; full fanega, 118 lbs.
Do	Uruguay (double)	7.776 bushels.
Do	Uruguay (single)	3.888 bushels.
Do	Venezuela	1.599 bushels.
Fanega (liquid)	Spain	16 gallons.
Feddan	Egypt	1.03 acres.
Frail (raisins)	Spain	50 pounds.
Frasco	Argentine Republic	2.5096 quarts.
Do	Mexico	2.5 quarts.
Frasila	Zanzibar	35 pounds.
Fuder	Luxemburg	264.17 gallons.
Garnice	Russian Poland	0.88 gallon.
Gram	Metric	15.432 grains.
Hectare	do	2.471 acres.
Hectoliter:		
Dry	do	2.838 bushels.
Liquid	do	26.417 gallons.
Joch	Austria-Hungary	1.422 acres.
Ken	Japan	6 feet.
Kilogram (kilo)	Metric	2.2046 pounds.
Kilometer	do	0.621376 mile.
Klafter	Russia	216 cubic feet.
Koku	Japan	4.9629 bushels.
Korree	Russia	3.5 bushels.
Kwan	Japan	8.28 pounds.
Last	Belgium and Holland	85.134 bushels.
Do	England (dry malt)	82.52 bushels.
Do	Germany	2 metric tons (4,480 lbs.).
Do	Prussia	112.29 bushels.
Do	Russian Poland	11⅔ bushels.
Do	Spain (salt)	4,760 pounds.
League (land)	Paraguay	4,633 acres.
Li	China	2,115 feet.
Libra (pound)	Argentine Republic	1.0127 pounds.
Do	Central America	1.043 pounds.
Do	Chile	1.014 pounds.
Do	Cuba	1.0161 pounds.
Do	Mexico	1.01465 pounds.
Do	Peru	1.0143 pounds.
Do	Portugal	1.011 pounds.
Do	Spain	1.0144 pounds.
Do	Uruguay	1.0143 pounds.
Do	Venezuela	1.0161 pounds.
Liter	Metric	1.0567 quarts.
Livre (pound)	Greece	1.1 pounds.
Do	Guiana	1.0791 pounds.
Load	England (timber)	Square, 50 cubic feet; unhewn, 40 cubic feet; inch planks, 600 superficial feet.
Manzana	Costa Rica	1⅝ acres.
Do	Nicaragua and Salvador	1.727 acres.
Marc	Bolivia	0.507 pound.
Maund	India	82⅔ pounds.
Meter	Metric	39.37 inches.
Mil	Denmark	4.68 miles.
Do	Denmark (geographical)	4.61 miles.
Milla	Nicaragua and Honduras	1.1493 miles.
Morgen	Prussia	0.63 acre.
Oke	Egypt	2.7225 pounds.
Do	Greece	2.84 pounds.
Do	Hungary	3.0817 pounds.
Do	Turkey	2.85418 pounds.
Do	Hungary and Wallachia	2.5 pints.
Pic	Egypt	21¼ inches.
Picul	Borneo and Celebes	135.64 pounds.
Do	China, Japan, and Sumatra	133⅓ pounds.
Do	Java	135.1 pounds.
Do	Philippine Islands	137.9 pounds.
Pie	Argentine Republic	0.9478 foot.
Do	Spain	0.91407 foot.
Pik	Turkey	27.9 inches.
Pood	Russia	36.112 pounds.
Pund (pound)	Denmark and Sweden	1.102 pounds.
Quarter	Great Britain	8.252 bushels.
Do	London (coal)	36 bushels.
Quintal	Argentine Republic	101.42 pounds.
Do	Brazil	130.06 pounds.

Foreign weights and measures, with American equivalents—Continued.

Denominations.	Where used.	American equivalents.
Quintal	Castile,[1] Chile, Mexico, and Peru	101.41 pounds.
Do	Greece	123.2 pounds.
Do	Newfoundland (fish)	112 pounds.
Do	Paraguay	100 pounds.
Do	Syria	125 pounds.
Do	Metric	220.46 pounds.
Rottle	Palestine	6 pounds.
Do	Syria	5¾ pounds.
Sagen	Russia	7 feet.
Salm	Malta	490 pounds.
Se	Japan	0.02451 acre.
Seer	India	1 pound 13 ounces.
Shaku	Japan	11.9305 inches.
Sho	do	1.6 quarts.
Standard (St. Petersburg)	Lumber measure	165 cubic feet.
Stone	British	14 pounds.
Suerte	Uruguay	2,700 cuadras (see Cuadra).
Sun	Japan	1.193 inches.
Tael	Cochin China	590.75 grains (troy).
Tan	Japan	0.25 acre.
To	do	2 pecks.
Ton	Space measure	40 cubic feet.
Tonde (cereals)	Denmark	3.94783 bushels.
Tondeland	do	1.36 acres.
Tsubo	Japan	6 feet square.
Tsun	China	1.41 inches.
Tunna	Sweden	4.5 bushels.
Tunnland	do	1.22 acres.
Vara	Argentine Republic	34.1208 inches.
Do	Central America	32.87 inches.
Do	Chile and Peru	33.367 inches.
Do	Cuba	33.384 inches.
Do	Curaçao	33.375 inches.
Do	Mexico	33 inches.
Do	Paraguay	34 inches.
Do	Spain	0.914117 yard.
Do	Venezuela	33.384 inches.
Vedro	Russia	2.707 gallons.
Vergees	Isle of Jersey	71.1 square rods.
Verst	Russia	0.663 mile.
Vlocka	Russian Poland	41.98 acres.

[1] Although the metric weights are used officially in Spain, the Castile quintal is employed in commerce in the Peninsula and colonies, save in Catalonia; the Catalan quintal equals 91.71 pounds.

METRIC WEIGHTS AND MEASURES.

Metric weights:

Milligram ($\frac{1}{1000}$ gram) equals 0.0154 grain.
Centigram ($\frac{1}{100}$ gram) equals 0.1543 grain.
Decigram ($\frac{1}{10}$ gram) equals 1.5432 grains.
Gram equals 15.432 grains.
Decagram (10 grams) equals 0.3527 ounce.
Hectogram (100 grams) equals 3.5274 ounces.
Kilogram (1,000 grams) equals 2.2046 pounds.
Myriagram (10,000 grams) equals 22.046 pounds.
Quintal (100,000 grams) equals 220.46 pounds.
Millier or tonnea—ton (1,000,000 grams) equals 2,204.6 pounds.

Metric dry measures:

Milliliter ($\frac{1}{1000}$ liter) equals 0.061 cubic inch.
Centiliter ($\frac{1}{100}$ liter) equals 0.6102 cubic inch.
Deciliter ($\frac{1}{10}$ liter) equals 6.1022 cubic inches.
Liter equals 0.908 quart.
Decaliter (10 liters) equals 9.08 quarts.
Hectoliter (100 liters) equals 2.838 bushels.
Kiloliter (1,000 liters) equals 1.308 cubic yards.

Metric liquid measures:

Milliliter ($\frac{1}{1000}$ liter) equals 0.0388 fluid ounce.
Centiliter ($\frac{1}{100}$ liter) equals 0.338 fluid ounce.
Deciliter ($\frac{1}{10}$ liter) equals 0.845 gill.
Liter equals 1.0567 quarts.
Decaliter (10 liters) equals 2.6418 gallons.
Hectoliter (100 liters) equals 26.417 gallons.
Kiloliter (1,000 liters) equals 264.18 gallons.

Metric measures of length:

Millimeter ($\frac{1}{1000}$ meter) equals 0.0394 inch.
Centimeter ($\frac{1}{100}$ meter) equals 0.3937 inch.
Decimeter ($\frac{1}{10}$ meter) equals 3.937 inches.
Meter equals 39.37 inches.
Decameter (10 meters) equals 393.7 inches.
Hectometer (100 meters) equals 328 feet 1 inch.
Kilometer (1,000 meters) equals 0.62137 mile (3,280 feet 10 inches).
Myriameter (10,000 meters) equals 6.2137 miles.

Metric surface measures:

Centare (1 square meter) equals 1,550 square inches.
Are (100 square meters) equals 119.6 square yards.
Hectare (10,000 square meters) equals 2.471 acres.

GAS AND OIL ENGINES IN FOREIGN COUNTRIES.

SPECIAL CONSULAR REPORTS.

EUROPE.

AUSTRIA-HUNGARY.

ENGINES IN USE.[1]

The prevailing system of gas engines in use in Austria-Hungary is the Otto motor, constructed by a well-known house in Germany, which has branches in most European capitals. This motor is built in sizes of from 1 to 12 horsepower, but is constructed to order in sizes up to 100 horsepower. It has one cylinder, and is driven by common illuminating gas, the price of which depends on the city and the central gas works. In some of the provincial towns, the price of gas is one-half of what it is in the larger cities.

The prices of this variety of motors are: For 1 horsepower, $300; 2 horsepower, $400; 3 horsepower, $500; 4 horsepower, $600; 5 or 6 horsepower, $700; 7 or 8 horsepower, $800; 10 horsepower, $1,000; 12 horsepower, $1,100; 16 horsepower, $1,300; 20 horsepower, $1,500; 25 horsepower, $1,700; 30 horsepower, $1,900. The consumption of gas in the Otto motor for a 2-horsepower engine is 20½ cubic feet in an hour; for a 4-horsepower engine, 19¼ cubic feet in an hour; for a 6-horsepower engine, 18¾ cubic feet in an hour.

The prices of the Otto motor are f. o. b. factory, or cash with 5 to 10 per cent discount, packing included. The firm that makes these motors is very liberal in its conditions, and has become popular in this country by its way of doing business. Credit is given for half the selling price for six months from the date of the invoice. Different terms seem to be made, according to the circumstances of the purchaser, every facility being given in the way of credit and easy payments. A competing firm, in order to do a profitable trade, would be obliged, at any rate in a measure, to offer conditions like those of the German firm in question.

Another system of gas engines in use in this country, but not so extensively introduced as the motor just mentioned, is the Adams

[1] Consul Mahin, of Reichenberg, says the Austrian import duty on gas engines is between $2.50 and $6 per 220.46 pounds, while Consul-General Hurst gives it at $3.45 per 220.46 pounds.

petroline motor. This motor is built up to 50 horsepower and is driven by petroline and similar gases. As is known, petroline is a very light kerosene, and is cheaper than either benzine or kerosene. Its price is $3 for 220 pounds, and a 6-horsepower engine consumes about 62 cents worth of petroline in ten hours. This engine was purposely built for the consumption of compressed petroline, which does not evaporate as freely as benzine, while there is no danger of explosion in connection with its use. Unlike kerosene, there is no tax whatever on this fluid, as the Government does not wish to burden the smaller craftsmen by whom these engines are usually employed. The gas is ignited by electricity, and the odor of the petroline is unnoticeable.

The demand for gas engines in this country is constantly increasing, as there is a great lack of electric stations in the different cities. Motors up to 12 horsepower are used in little factories and workshops. The larger gas engines for outside work are being set up at the coal mines and elsewhere. The possibility of the profitable introduction of a new system of gas engines can only be recommended to a firm which is able to compete on similar lines with those already established here in the business. An American firm ought to have a Vienna showroom and full stock of parts, with a sufficient force of mechánics to repair immediately machines which get out of order. In a small workshop or factory, where all the power depends on a single gas motor, the workmen can not afford to be idle. The engine must be repaired without delay. The local firms, selling the two systems which I have mentioned, have mechanics ready to go out at a moment's call.

There will be a demand for about 2,000 gas engines a year for the next four or five years. I should add that many German gas engines have been set up in Vienna from parts chiefly imported from the German Empire.

FUEL

The chief fuels available in Austria are coal, wood, peat, and crude petroleum. The price of boiler coal for factories is from $7.50 to $8 the ton (2,204.6 pounds). It is considerably higher than the price of American coal and the importation of coal from the United States is rapidly increasing. Steam boilers heated by petroleum are in use only in Galicia. This is not owing to the price of the material, but to the laws controlling the use of this product in Austria and the two separate inland taxes imposed upon it. Crude petroleum costs $1.22 per 220 pounds, if employed for industrial purposes.

TRANSPORTATION AND FREIGHT RATES.

The facilities for transportation from the United States are offered by two lines in Trieste, Austria's principal seaport, which periodically run ships to New York. These steamers average about 4,000 tons and

also touch at Fiume, the second port in the monarchy, though not regularly. The ocean freight for machines is about $7.20 a ton, hence about $1.20 a ton cheaper than the freight via Hamburg to Austria. Hamburg steamers ply to the number of four and five in one week between New York and Hamburg. The freight is computed by space, but that for machines may be set with approximate certainty at $6.20 a ton. Bales weighing not more than 4,400 pounds are shipped down the Elbe to the Austrian frontier (Tetschen) for from $1.44 to $2.16 a ton. The cost of freight, therefore, from New York via Hamburg to the Austrian border, including all expenses at Hamburg, amounts to about $8.40. The difference in cost of freight, New York-Trieste and New York-Hamburg-Tetschen, is balanced by the swifter transit and greater capacity of the Hamburg vessels and the Elbe Navigation Company.

CARL BAILEY HURST,
Consul-General.

VIENNA, *October 12, 1900.*

REICHENBERG.

ENGINES IN USE.

Gas engines are in use in this consular district. It is impossible to state the number, but it is quite large. The prices range from about $80 for a 2-horsepower to $1,200 for a 20-horsepower engine. These prices include freight and the complete setting up, ready for business, at the place of use.

The gas engines found here come mostly from Vienna, though a few are from Germany.

The prospect for introducing American gas engines into this consular district does not seem favorable. In Reichenberg, the company supplying the community with gas will at the end of its present contract install a large electric plant for motor as well as lighting purposes. In view of this, parties who now use gas engines in this city say that they intend to supplant them with electric motors when the power can be had. Generally throughout the district, a preference exists for electric appliances wherever they can be made available. American gas engines could be introduced into this section only by personal solicitation, backed by very low prices and favorable terms of payment.

FUEL.

For fuel, gasoline and kerosene sell at about 25 cents a gallon. At this date, the price of coal is 3.36 crowns per 100 kilograms (68 cents per 220.46 pounds). This is nearly double the price prevailing before the coal miners' strike of last winter.

FREIGHT RATES.

Freight for this territory is usually shipped via Bremen or Hamburg, to which ports the rate from New York is $2.75 to $3 per cubic meter (35.316 cubic feet) on slow steamers and about $7.50 on fast steamers. From those seaports to Reichenberg, the railroad rate is 62 cents to $1.10 per 100 kilograms (220.46 pounds). The Elbe River can be used from Hamburg in summer at a rate somewhat less.

TRIESTE.

ENGINES IN USE.

There are in use in this consular district probably not far from 200 gas engines, ranging from 1 to 65 horsepower. The capacity of the engine chiefly in demand is from 2 to 6 horsepower. Formerly, only engines of Austrian manufacture were used, but now large importations are made from England.

The principal engine builders supplying machines for this district are Langen & Wolf, Vienna; Tangyes (Limited), Birmingham; Crossley Brothers, Manchester; Fielding & Platt, Gloucester.

The following are the prices of gas engines manufactured in Vienna and laid down free of all expenses at Trieste:

Horsepower.	Price.		Horsepower.	Price.	
	Crowns.			*Crowns.*	
6	3,030	$615.09	16	5,650	$1,146.95
8	3,480	706.44	20	6,600	1,339.80
10	4,370	887.11	25	7,450	1,512.35
12	4,820	978.46	30	8,350	1,695.05

The following are the prices of gas engines manufactured in England and laid down at Trieste free of all expenses, including duty:

Horsepower.	Price.		Horsepower.	Price.	
	Crowns.			*Crowns.*	
5	1,850	$375.65	22	4,530	$919.59
7	2,200	446.60	28	6,260	1,260.78
10	2,850	577.55	35	6,970	1,415.00
13	3,290	667.87	65	13,880	2,817.60
18	4,150	842.45			

FUELS.

The fuels obtainable are lignite and bituminous coal, wood, kerosene, naphtha (benzine), and illuminating gas. The present price of kerosene is 45 crowns ($9.13) per 220.48 pounds, and that of naphtha

(benzine) 53 crowns ($10.75) per 220.48 pounds. Neither of these is, however, used to a great extent as fuel, while gasoline and crude petroleum have so far not been used at all.

For steam boilers employed in industrial establishments, the principal fuel in this city is a lignite from the Austrian province of Styria, and this is at present sold here at 28 crowns ($5.68) per ton (2,204.6 pounds). Good bituminous coal is now worth from $9 to $11 a ton, and hard wood from $7 to $10 a cord.

Illuminating gas for the special use of gas engines is supplied by the city gas works at the rate of 17 hellers (2.48 cents) per cubic meter (35.316 cubic feet).

TRANSPORTATION AND FREIGHT RATES.

There are two lines of steamers which ply between Trieste and New York, viz, the Austro-American Steamship Company (New York agents, Barber & Co.) and the Mediterranean and New York Steamship Company (New York agents, Phelps Brothers). The vessels of the former sail under the Austro-Hungarian and those of the latter under the British flag.

Shipments to Trieste can also be effected by a through bill of lading on any of the regular steamers sailing from New York to Great Britain or Hamburg. Direct freight rates on machines from New York to Trieste vary from 20s. to 30s. ($4.86 to $7.29) per ton of 42 cubic feet.

HOW TO INTRODUCE AMERICAN ENGINES.

My advice to those wishing to introduce American gas engines into this district is to work, as far as practicable, hand in hand with the principal engineering firms of Trieste. They are Schnabl & Co., Cozzi & Co., Ermanno Turek & Co. If possible, agents possessing a practical knowledge of the construction and operation of gas engines should be sent here to convince these firms of the superiority of our machines and to assist in their introduction. Should the cooperation of the firms mentioned not be first secured, they might combine to oppose the sale of the American product, and in a conservative country like Austria such opposition is, as a rule, more effectual than elsewhere.

In my opinion, the scarcity of water in this consular district makes the introduction of gas engines a comparatively easy task, and I can see no reason why American-made machines should not be able to compete here.

FREDK. W. HOSSFELD, *Consul.*

TRIESTE, *September 18, 1900.*

BELGIUM.

ANTWERP.

ENGINES IN USE.[1]

Gas engines are employed to considerable extent in Belgium, though this consular district not being, commercially speaking, a manufacturing center, to a somewhat limited degree here. Here as elsewhere, their use is confined to such interests as demand a relatively small amount of horsepower and where economy of space is requisite. These machines are manufactured in this country, though preference is ordinarily given to those imported from England and Germany, as the prices of the foreign manufacture, considering their quality, are somewhat less. From the following tables will be seen the prevailing prices of the different manufactures in demand at the present time:

Maximum horsepower.	Weight.	Revolutions per minute.	Price.
English make:			
Horizontal—	*Pounds.*		
2	830	300	$243
3¾	1,910	250	347
6½	2,810	240	485
8	3,040	240	535
9½	3,600	220	588
14	5,620	210	733
18	7,870	150 to 200	810
German make:			
Horizontal, single fly-wheel—			
½		260	217
1		240	265
2		230	338
3		230	434
4		220	531
5		210	579
6		220	675
8		190	772
10		190	941
German make:			
Double fly-wheel—			
12			1,110
15			1,303
20			1,520
25			1,689
30			1,906

Maximum horsepower.	Weight.	Revolutions per minute.	Price.
German make, Double fly-wheel—Cont'd.	*Pounds.*		
35			$2,051
40			2,412
50			2,533
60			2,654
Otto, manufactured in Liege:			
Vertical—			
1 5/10		230	246
2 5/10		210	318
3 5/10		210	395
5		200	468
Horizontal—			
1 4/10		250	260
2 5/10		250	332
3 7/10		250	405
5		240	492
7		240	646
10		220	733
12		200	880
14		200	955
18		200	1,066
20		200	1,172
25		200	1,346
30		200	1,534
35		200	1,708

[1] Consul Le Bert, of Ghent, gives the following as the rates of duty levied on machinery entering Belgium:

Customs duty on machinery of all kinds.—In cast iron, 2 francs per 100 kilos (38.6 cents per 220 pounds); in iron or steel, 4 francs per 100 kilos (77.2 cents); in copper or all other material, 12 francs per 100 kilos ($2.32); in wood, 10 per cent of value.

Detached pieces of machinery are classified under the same rule, upon condition that they have received such a degree of completion that they can be adapted without having to be submitted to further workmanship.

Machines or pieces of machinery subject to different duties are classified according to predominating material of which they are made, according to weight, to this effect, that the different materials figuring in the same category are united to establish the classification.

FUEL.

All the fuels in common use are available in this district and the prices of the same are about as follows at the present time:

Kerosene from $2.31 to $2.70 per 100 kilograms (220.46 pounds), net in bulk, delivered; gasoline, $8.87 per 100 kilograms; benzine, $7.14 per 100 kilograms; naphtha, $6.75 per 100 kilograms; coal, suitable for steam purposes, from $5.79 to $6.75 per ton.

TRANSPORTATION AND FREIGHT RATES.

The facilities for transportation from Atlantic ports to this country are, as is well known, afforded by the Red Star Line from New York and Philadelphia, the Phœnix Line from New York and Newport News, and the Puritan Line from Boston and Baltimore.

The prevailing freight rate on machinery by the Red Star Line from New York or Philadelphia to Antwerp is quoted at present at $4.65 per 1,000 kilograms, or 2,204.60 pounds, or 40 cubic feet, at option of ship.

ANTWERP, *September 13, 1900.*

BRUSSELS.

ENGINES IN USE.

Gas engines are extensively used in this consular district in the following industries: Breweries, printing houses, printing presses, manufacture of billiard balls, cutlery, lamps, electrical supplies, instruments, wood turning, gaseous waters, bakeries, mustard and sausage making, coke, etc.

The demands of this market are supplied by Belgian, English, and German production. German machines are shipped direct to the importer by rail; those from England come by boat to Antwerp, thence by rail to Brussels.

Prevailing prices of engines.

Horsepower.	Price.	
ENGLISH.		
Gas engines:	*Francs.*	
2½	1,000	$193.00
3½	1,250	241.25
5½	1,800	347.40
6¾	2,200	424.60
8½	2,500	482.50
12½	3,000	589.00
16½	3,300	636.90
21½	4,000	772.00
26¾	4,900	945.70
32½	5,600	1,080.80
40	7,000	1,351.00
44	8,300	1,601.90
Petroleum engines:		
1	1,450	279.85
2	1,950	376.35
3	2,300	443.90
4	2,700	521.10
6	3,100	598.30
8	3,700	714.10
10	4,400	849.20
12	5,200	1,003.60
14	5,400	1,042.20
16	6,000	1,158.00
20	6,900	1,331.70
BELGIAN.		
Gas engines:		
Vertical—		
½	1,000	193.00
1	1,250	241.25
2	1,550	299.15
3	2,000	386.00
4	2,400	463.20
5	2,600	501.80
6	2,800	540.40
Horizontal—		
2	2,100	405.30
3	2,400	463.20
4	2,750	530.75
6	3,300	636.90
8	4,500	868.50
10	4,900	945.70
12	5,400	1,042.20
14	5,950	1,148.35
16	6,500	1,254.50
20	7,600	1,466.80
25	9,100	1,750.30
30	11,000	2,123.00
Industrial—horizontal—		
2	1,950	376.35
3	2,200	424.60
4	2,500	482.50
6	3,000	589.00
8	4,000	772.00
10	4,500	868.50
12	5,000	965.00
14	5,500	1,061.50
16	6,000	1,158.00
20	7,000	1,351.00
25	8,500	1,640.50
30	10,000	1,930.00
Petroleum engines:		
Vertical—		
½	1,200	231.60
1	1,500	289.50
2	1,800	347.40
3	2,250	434.25
4	2,650	511.45
5	2,850	550.05
6	3,050	588.65
Horizontal—		
2	2,300	443.90
3	2,650	511.45
4	3,000	589.00
6	3,550	685.15
8	4,750	916.75
10	5,250	1,013.25

Horsepower.	Price.	
BELGIAN—continued.		
Petroleum engines—Continued.		
Horizontal—Cont'd.	*Francs.*	
12	5,650	$1,090.45
14	6,200	1,196.60
16	6,800	1,312.40
20	8,100	1,563.30
25	9,100	1,852.80
30	11,500	2,219.50
Industrial—horizontal—		
2	2,150	414.95
3	2,450	472.85
4	2,750	530.75
6	3,250	627.25
8	4,250	820.25
10	4,850	936.05
12	5,250	1,013.25
14	5,750	1,109.75
16	6,300	1,221.90
20	7,500	1,447.50
25	9,000	1,737.00
30	10,500	2,026.50
Gas dynamos:		
2	3,400	656.20
4	4,450	858.50
6	5,300	1,022.90
8	6,850	1,322.05
10	7,400	1,428.20
12	7,900	1,524.70
16	9,150	1,765.95
20	10,350	1,997.55
25	13,000	2,509.00
30	15,000	2,895.00
Benzine dynamos:		
2	3,600	694.80
4	4,700	907.10
6	5,550	1,071.15
8	7,100	1,370.30
10	7,700	1,486.10
12	8,200	1,582.60
16	9,450	1,823.85
20	10,850	2,094.05
25	13,500	2,605.50
30	15,500	2,991.50
GERMAN.		
Gas engines:		
Vertical—	*Marks.*	
¼	600	142.80
½	800	190.40
1	1,000	238.00
2	1,400	333.20
3	1,800	428.40
4	2,100	499.80
5	2,400	571.20
6	2,700	642.60
8	3,100	737.80
10	3,600	856.80
12	4,000	952.00
Horizontal—		
1	1,100	261.80
2	1,500	357.00
3	1,800	428.40
4	2,200	523.60
5	2,500	595.00
6	2,900	690.20
8	3,300	785.40
10	4,000	952.00
12	4,500	1,071.00
Benzine engines:		
Vertical—		
½	1,000	238.00
1	1,250	297.50
2	1,600	380.80
3	2,000	476.00
4	2,300	547.40
5	2,600	618.80
6	2,900	690.20

FUELS.

Fuels available in Belgium suitable for steam boilers, etc., are coal, crude and refined oils, kerosene, gasoline, and all kinds of distillations. The prices are as follows, per 100 kilograms (220.46 pounds):

Petroleum, crude, $1.93; petroleum, refined, $3.474; benzine (680 per cent), $7.141; gasoline (640 per cent), $8.878; naphtha (700 per cent), $6.755; coal, $6.755 to $7.72 per ton.

TRANSPORTATION AND FREIGHT RATES.

The present facilities for transportation of goods from the United States to Belgium via Antwerp are as follows: Red Star Line, from New York and Philadelphia; Puritan Line, from Baltimore and Boston; Wilson Line, from New York; White Cross Line, New York and Boston; New Orleans Line, from New Orleans.

Goods coming from the United States to Belgium are landed directly at the docks at Antwerp and are shipped to the interior towns and cities via railroads and canals. The rates of freight between Antwerp and the United States vary with the fluctuations in the freight market and are greatly influenced by competition, size of cargo, and rating of the ship. The average charge from Antwerp to New York, Philadelphia, and Boston for heavy goods, rate determined by weight, is $1.50 per ton; for light articles, rate determined by space occupied, $5 per ton, and 10 per cent additional per 40 cubic feet.

OUTLOOK FOR AMERICAN ENGINES.

Foreign competitors have established successful business in this district, by agencies superintended by competent men well supplied with samples, which have been attractively exhibited and judiciously advertised. Under similar business methods, which is the only really profitable manner of introducing American gas engines on this market, there is no reason why our manufacturers should not be as successful as British and German manufacturers in securing part of the trade.

GEO. W. ROOSEVELT, *Consul.*

BRUSSELS, *September 6, 1900.*

GHENT.

ENGINES IN USE.

There are many gas engines in use in the different cities of this consular district, and especially in Ghent, where they have given general satisfaction and are rapidly gaining in popularity. Here, there are a number of English makes in the market, the chief and most popular

of which is the Otto Forward, made by T. B. Barker & Co., Birmingham, England. They are delivered at the following prices:

Effective horsepower.	Price.	Effective horsepower.	Price.
2¾	$250.90	12	$579.00
4	337.75	16	649.80
5¼	366.70	20	829.90
8	443.90	24	1,080.80
11	530.75		

Each engine is supplied with the following appliances: One cast-iron gas pocket, antipulsatory; one corresponding pulley, one extra spring for each type existing in the engine, one set of keys, six extra ignition tubes, and one exhaust box.

The prices of engines in the two following tables include with each engine starting apparatus, foundation, bolts, cast-iron exhaust box, cast-iron air box, two rubber gas bags, complete equipment of lubricators, key for screws, three incandescent tubes, and two spare piston rings:

Horsepower.	Price.	Length of engine.	Width of engine.	Heights of engine.	Revolutions per minute.	Diameter of pulley.	Width of belting.
		Ft. in.	*Ft. in.*	*Ft. in.*		*Ft. in.*	*Inches.*
1⅜	$260.55	4 11	2 1⅜	4 7 1/10	250	0 7	2
2½	332.93	5 9	2 7⅜	4 11⅜	250	0 11	2
3 7/10	405.30	6 6 7/10	2 11⅜	5 3	250	1 1	3
5	492.15	7 2⅜	3 3 1/10	5 4 9/10	240	1 3	3
7	646.55	7 8½	3 9 9/10	5 6 9/10	240	1 7	5
10	733.40	8 8 3/10	4 3½	5 10½	220	1 11	5
12	880.08	9 4⅜	4 7 9/10	5 10½	200	2 3	6
14	955.35	9 6½	4 9	5 10⅜	200	2 9	6
18	1,056.33	10 6	5 3	6 2⅜	200	3 1	7
20	1,172.48	10 6	5 3	6 2⅜	200	3 3	7
25	1,346.18	11 5½	5 10½	6 4	200	3 10	7
30	1,534.35	11 10 7/10	5 11 9/10	6 4	200	4 6	7
35	1,708.05				200	4 10	7

Effective horsepower.	Price of engine.	Length.	Width.	Height.	Revolutions per minute.	Size of gas meter necessary.	Price of engine especially built for the production of electric lights.	
							With two powerful fly wheels.	With long shaft and outside extra bearing without pulley.
		Ft. in.	*Ft. in.*	*Ft. in.*		*Burners.*		
40	$1,930.00	14 1	7 10	6 3	190	250	$2,065.10	$2,195.38
48	2,200.20	14 5	8 2	6 7	190	250	2,344.95	2,451.10
60	2,316.00	14 11	8 2	6 11	190	300	2,509.00	2,629.63
68	2,451.10	16 5	9 6	7 3	180	300	2,673.05	2,829.38
90	3,088.00	18 4	12 0	8 2	160	400	3,406.45	.....
112	3,715.25	19 8	12 6	8 10	150	500	4,072.30	.....
138	4,342.50	23 0	15 9	9 6	140	600	4,747.80	.....
165	4,469.75	23 7	16 4	9 10	140	750	5,572.88	.....

Engines of from 40 to 68 horsepower are provided with self-starter.

In order to put in action engines of from 90 to 165 horsepower, there must be employed a special motor with compressed air apparatus.

INTRODUCTION OF AMERICAN ENGINES.

The introduction of American gas engines, taking it for granted that they are equal if not superior to foreign makes, would depend upon the cost laid down; there should be a guaranty to the purchaser that accessories, castings, and parts of engines could be readily obtained, so as to avoid long delays in case of loss or breakdown. The better and safer method of introduction would be the establishment of a central agency and storage room at Brussels or Antwerp. Brussels being more centrally located would probably be the better point, where the different sizes and constructions could be kept in stock and displayed to advantage, and whence subagencies could be established throughout the different important cities of Belgium, none of which are farther distant than from one to one and one-half hours ride by rail. There are not many sales made by agents here. Generally, the different kinds of machinery are purchased at Brussels or Antwerp, where the purchaser has the advantage of a choice after examining the different makes displayed by agencies, and also the benefit of greater competitive prices.

FUEL.

Petroleum is imported from the United States and Russia. The price of fuel oils, including barrels, delivered in city, is as follows: Kerosene, water white, 150°, 24 to 26 francs per 100 kilograms (13.7 to 14.9 cents per gallon); kerosene, standard, 73°, 19 to 20 francs (11 to 11.6 cents); gasoline, 36 to 38 francs (18.3 to 19.3 cents); gas oil or Russian astaki, 14 to 15 francs (9 to 9.8 cents). Crude oil is not obtainable in Belgium.

Prices of coal are constantly fluctuating. At this date the price of steam coal of different grades, delivered in city, is as follows: Semi-bituminous (American mine), 26.56 francs per 1,000 kilograms ($5.13 per 2,205 pounds); from Charleroi, 25.56 francs per 1,000 kilograms ($4.93). Full bituminous, industrial washed eight-fifteenths of a millimeter (0.0394 inch), 31.56 francs per 1,000 kilograms ($6.09 per 2,205 pounds); large seventeen-eighteenths of a millimeter, 35.56 francs per 1,000 kilograms ($6.86).

The price of gas fluctuates with coal. At this date, it is 12 centimes (2.32 cents) per cubic meter (35.316 cubic feet).

FREIGHT RATES.

Railroad freight rates from Antwerp to Ghent on machinery, set up or knocked down, weighing less than 5,000 kilograms (11,023 pounds), are 8.20 francs ($1.58); over 5,000 kilograms, 7.20 francs ($1.39) per 1,000 kilograms (2,205 pounds). By canal from Antwerp to Ghent, from dock of canal-boat company, Antwerp, to dock of company at Ghent, 4.50 francs (87 cents) per 1,000 kilograms (2,205 pounds);

minimum, 2.50 francs (48 cents). No single package must exceed 1,500 kilograms (3,307 pounds) in weight.

The canal is navigable every day throughout the year.

GHENT, *September 15, 1900.*

RICHARD LE BERT, *Consul.*

LIEGE.

ENGINES IN USE.

Gas engines are in general use in this consular district by parties requiring less than 30 horsepower, although occasionally one of 50 and even 100 horsepower is found. Nearly all in use here are manufactured in Belgium. One company in this city, Société Anonyme des Etablissements Fetu-Defize, has placed during the last four years more than 2,000 of its engines in this country. The managers control the Otto patent for Belgium. It is a strong company, manufacturing a large line of machinery.

The following table gives the power, price, dimensions, etc., of some of the engines manufactured by the above company:

Horsepower.	Price of engine.	Length.	Width.	Height.	Revolutions per minute.
		Ft. in.	*Ft. in.*	*Ft. in.*	
1½	$270	5 0	2 0	4 6	250
2½	345	5 7	2 6	4 8	250
3½	420	6 4	3 0	5 0	250
5	510	7 0	3 3	5 4	240
7	670	7 3	3 6	5 9	240
10	760	7 8	3 9	5 9	220
12	912	8 4	4 2	5 9	200
18	1,105	9 6	5 0	6 2	200
20	1,215	9 6	5 0	6 5	200

The manufacturer guarantees that the cost of running a 10-horsepower engine for ten hours at full pressure shall not exceed 5.60 francs ($1.08) when gas sells at 10 centimes (2 cents) a cubic meter, or 56 cents per 1,000 cubic feet, which is the price now paid in this city. Smaller engines cost a little more, in proportion to the horsepower, amounting to about two-fifths more in a 1½-horsepower engine.

The above company also manufactures engines run with kerosene, after the Otto patents, on the same system as the gas engines.

The following table gives the power, price, dimensions, and speed:

Horsepower.	Price of engine.	Length.	Width.	Height.	Revolutions per minute.
		Feet.	*Feet.*	*Feet.*	
1½	$400	5.2	2.1	4.7	250
2½	460	5.7	2.5	5.1	250
3½	560	6.5	2.9	5.3	250
5	650	6.9	3.3	5.4	240
7	840	7.3	3.7	5.7	240
10	920	7.9	4.1	6	220
12	1,040	8.5	4.8	6.2	200
14	1,190	8.5	4.8	6.2	200
18	1,300	9.7	5	6.3	200
20	1,420	9.7	5	6.3	200

The manufacturers guarantee that a 10-horsepower engine will not consume to exceed 4.5 kilograms of kerosene oil per hour, or 45 kilograms (99 pounds) per day of ten hours, when the engine is run at full pressure.

I am informed that no gasoline engines are used in this district save on automobiles and tricycles, and that crude petroleum is not used in any manner, and I am not able to quote prices. Gasoline sells here at about 15 cents per gallon.

FUEL.

The wholesale price of kerosene varies from 12 to 15 cents per gallon, being highest in winter.

Coal, which is extensively mined in the Liege basin, is the principal fuel used in this consular district. The price of medium steam coal at the mines is from 21 francs ($4.05) to 23 francs ($4.44) per ton of 2,204.6 pounds. Good coke can be had for 55 francs ($10.62) per ton.

TRANSPORTATION AND FREIGHT RATES.

Transportation facilities between this consulate and Antwerp are excellent, either by rail or canal. The rate by rail for fast freight, per inclosed car of 10,000 kilograms (22,046 pounds), is 90.70 francs ($17.50); for open car, 72.60 francs ($14.01); and for slow freight, inclosed car, 27.60 francs ($5.33); for open car, 22.10 francs ($4.27). For less than carload lots, 12.04 francs ($2.32) per ton of 1,000 kilograms, or 2,204.6 pounds; by canal, 2.50 francs ($0.48).

OUTLOOK FOR AMERICAN ENGINES.

I believe there is a good opening for our gas-engine manufacturers, providing an agency be established where a full line of parts may be kept for customers in case of breakage. American machinery is recognized as being superior, and will generally be taken at the same price as that made in Europe, and even at a somewhat higher price, when the buyer can be made to understand that he will not be delayed in getting parts in case of accident.

ALFRED A. WINSLOW, *Consul.*

LIEGE, *October 9, 1900.*

FRANCE.[1]

ENGINES IN USE.

Gas and petroleum engines are extensively used in France, by reason of their greater fuel economy as compared with steam engines, and also on account of their immunity from the danger of explosion. The latter attribute makes it possible to use them in places where the severe restrictions of the French law governing the installation of steam boilers would not allow a steam plant to be erected.

The gas and petroleum engines used in France are mostly of French make, and are manufactured principally by the following firms, enumerated in the order of their importance: Schneider & Co., Creusot, manufacturers of the Delamare-Debouttéville engine; Compagnie Française des Moteurs à Gaz et des Constructions Mecaniques, 155 Rue Croix Nivert, Paris, manufacturers of the gas and petroleum motors "Otto;" Compagnie des Fives Lille, 3 Place de Rehour, Lille, manufacturers of the motor "Letombe;" Société Générale des Industries Economiques, 40 Rue Lafayette, Paris, manufacturers of the motor "Charon;" Compagnie des Moteurs Niel, 22 Rue Lafayette, Paris, the gas engine "Niel;" Compagnie Duplex, 130 Rue Lafayette, the gas and petroleum engines "Duplex;" Sociétés des Fonderies de Cuivre de Lyons, Macon and Paris, 44 Rue Lafayette, Paris, the gas and petroleum engines "Gnome;" Compagnie des Moteurs Universels, 56 Rue Lafayette, Paris, the "Grob" engines; and Caloin & Marc, 37 Rue d'Arcole, Lille, the gas and petroleum engines "Champion."

All the above engines work on the well-known Otto principle, and are provided with one or more cylinders of either the horizontal or vertical type.

Of the foreign engines imported into France, the well-known Crossley gas engine, made in Manchester, is the most extensively used. The Paris agency is J. & O. G. Pierson, 54 Faubourg Montmartre.

[1] *Duties.*—According to Consul Thackara, the French customs duties on gas and petroleum engines coming from the United States direct are as follows:

Engines weighing 250 kilograms (551 pounds) and over, 18 francs ($3.47) per 100 kilograms (220.46 pounds); less than 250 kilograms (551 pounds), 30 francs ($5.79) per 100 kilograms.

The fly wheels can be imported separately. If they are machined, they pay a duty of 15 francs ($2.90) per 100 kilograms, and if rough they come under the head of cast iron and pay as follows: For pieces weighing more than 50 kilograms (110.2 pounds), 6 francs per 100 kilograms ($1.16); from 5 kilograms (11 pounds) to 50 kilograms, 7 francs per 100 kilograms ($1.35); less than 5 kilograms (11 pounds), 8 francs per 100 kilograms ($1.54).

If imported indirectly from the United States by the way of a European country, the above machines are subject to a surtax of 3.60 francs (69½ cents) per 100 kilograms.

This engine is also similar in construction to the one built by the Compagnie Française des Moteurs à Gaz, Otto system. The only American engine for sale in France of which I have any knowledge is that manufactured by Metz & Weiss, of New York City, of which Markt & Co., 76 Rue de Turenne, Paris, are the agents. These gentlemen inform me that, owing to the short time during which they have handled the engine, they can not say yet whether there will be a sale for it in the French market.

The prices of the different makes of engines vary. The following, however, are the average prevailing quotations at the factory, packing not included:

Horizontal gas engines:	
1 horsepower	$290.37
2 horsepower	418.33
5 horsepower	590.58
7 horsepower	697.21
10 horsepower	869.56
14 horsepower	1,090.93
20 horsepower	1,394.52
25 horsepower	1,476.45
30 horsepower	1,574.88

For engines from 35 up to 1,000 horsepower, only special prices are quoted.

Vertical gas engines:	
¾ horsepower	$205.06
1 horsepower	240.08
2 horsepower	311.70
3½ horsepower	459.34
5 horsepower	524.96
Petroleum engines:	
1½ horsepower	397.00
2½ horsepower	483.95
5 horsepower	689.01
7½ horsepower	861.26
10½ horsepower	967.90

The foregoing prices include the usual accessories, but the cost of installation is extra.

Blast-furnace gases, which in the United States go to waste, are utilized in France and made to operate large gas engines for the production of electricity. The latter is used for the manufacture of electro-chemical products, for lighting and power purposes, and also for the driving of the blowers operating the blast furnaces.

Schneider & Co., of Creusot, the manufacturers of the Delamare-Debouteville engines, have entered the field extensively. It is no wonder, when it is considered that a blast furnace producing 100 tons of iron every twenty-four hours emits more than 200,000 cubic meters of gas, which usually goes to waste, and that this gas represents in

energy about 2,800 horsepower, only 800 of which are required to operate the blast furnace; there remains, therefore, an excess of power of about 2,000 horsepower available for other uses.

TRANSPORTATION AND FREIGHT RATES.

The principal means of communication between the Atlantic ports of the United States and those of northern France are the regular steamers of the French Line, sailing weekly from New York to Havre; the auxiliary freight steamers of the same line, sailing about every twenty days to Havre and Bordeaux; the Barber Line, with irregular sailings, sometimes twice a month, from New York to Havre and to Dunkirk, when there is sufficient cargo for that port, and the Blue Cross Line from Baltimore to Havre, sailing about once a month.

The price of freight from New York to Havre by the cargo boats of the French Line is $6 per 40 cubic feet.

I am informed by a large importer of American machinery that it costs on an average 120 francs ($23.16) per ton to bring American machines from New York to Paris, not including customs tariff, but including all expenses of shipment, transshipment, railroad freights from Havre to Paris, commissions, etc.

FUELS.

The prices of fuels at the present time are constantly changing. The prices on an average per ton are as follows:

French coal at the mines, Bassin du Nord, September, 1900: Large, 18 centimeters (7.08 inches) or more, 34 francs ($6.56); nut, screened, 33 francs ($6.37); coal for boilers (one-third large), 23 francs ($4.44); coke (small), 45 francs ($8.69); foundry coke, 52 francs ($10.04).

English coal c. i. f. Havre, October: Cardiff, colliery screened: Best, large, 34s. 6d. ($8.38) to 36s. 6d. ($8.88); seconds, 32s. 6d. ($7.90) to 33s. 6d. ($8.14); ordinary, 30s. 6d. ($7.42) to 31s. 6d. ($7.66); drys, 32s. 6d. ($7.90). Monmouthshires: Western valleys, large, 30s. 6d. ($7.42) to 31s. 6d. ($7.66); eastern valleys, large, 29s. ($7.04) to 30s. ($7.30). Swansea: Best, large, steam, 31s. ($7.54) to 35s. ($8.50); seconds, steam, 27s. 6d. ($6.68) to 29s. ($7.04); best, large anthracite, 30s. 6d. ($7.42) to 31s. 6d. ($7.66); ordinary anthracite, 27s. ($6.56) to 28s. ($6.80). Through and through, or as it comes from the mines: Cardiff, best, 27s. 6d. ($6.68) to 28s. ($6.80); Newport, best, 25s. ($6.08) to 25s. 6d. ($6.20); Swansea, best, 26s. ($6.32).

Oils (market September, 1900), per 100 liters (26.417 gallons): Petroleum, 31 francs ($5.98); naphtha, 40 francs ($7.72); automobiline (density, 0.69050), 50 francs ($9.65); gasoline (density, 0.710), 43 francs ($8.30).

The above prices do not include the town dues, or octroi, which at Havre are 4 francs (77 cents) per 26.417 gallons.

Oils sold under the head of automobiline, autonaphtha, stelline, etc., are all made of the same material of about 0.680 to 0.690 density.

Liquid vegetable tar, 55 francs ($10.62) per 26.417 gallons; liquid mineral tar, 15 francs ($2.90) per 26.417 gallons.

OUTLOOK FOR AMERICAN ENGINES.

Owing to the geographical position of the United States, and to the high tariff applied to American engines, it is difficult to import with profit gas engines of any considerable size from our country into France. It would seem, however, that for the operation of automobiles, pleasure boats, etc., small gasoline engines might be imported advantageously. The automobile business has assumed immense proportions in France, owing greatly to the splendid roads with which this country is provided. In this connection, it might not only be advisable to import the motor, but also the vehicle, for which, owing to American ingenuity and skill, a market could be made in competition with French-built motor cars. Up to the present, I am not aware that any such venture has been tried, Americans having given the major share of their attention to electric and steam automobiles, which are not extensively employed in this country.

A. M. Thackara, *Consul.*

Havre, *October 10, 1900.*

BORDEAUX.

ENGINES IN USE.

Gas engines are in use in this district to a considerable extent—to what extent I can not say, as there is no means of ascertaining. They are chiefly, if not entirely, of French manufacture.

FUEL.

Kerosene retails for 40 centimes (8 cents) per liter (1 gallon being equal to 3.785444 liters). Gasoline is sold at 60 centimes (12 cents) per liter in cans of 50 liters and upward at a time, without the cans. Reliable wholesale quotations are difficult to obtain. Coal, anthracite, is now about $15 per ton, delivered to the consumer.

TRANSPORTATION.

If machinery, or almost anything else, is imported into France indirectly; that is, if it lands in any foreign port, or is transferred from one ship to another in a port of any other European power, or on a ship that calls at a port of any other European power, on its way to France, an additional duty of 3 francs 60 centimes per 100 kilograms, amounting to something more than $6 per ton, is imposed

before the goods can be landed. This is called a "surtaxe," and all goods coming from the United States via English or German ports, or on ships that even touch at a port of any other country before arriving in France, must pay it.

There are two direct lines from New York to Bordeaux. If goods are sent by them, they avoid the payment of the "surtaxe."

The payment of the "surtaxe" is also sometimes avoided by putting English marks on the goods in the factory in the United States and shipping them to a factor in Liverpool or London, who removes the addresses, substitutes new ones, and exports them to France as "Made in England." As most British manufactures are admitted at the "minimum tariff" while most of ours pay the "maximum tariff," the reduction in rate is considerable, even without considering the "surtaxe," which is never imposed on the goods of a European country.

FREIGHT RATES.

The cost of freight from New York to any European port can be learned in America with much less labor and much greater accuracy than on this side. No such thing as a quotation on freight from New York, or any other American city, to Bordeaux can be obtained here. There are two direct lines and agents of at least four indirect lines through English or German ports. Not one of these will quote a price from New York to Bordeaux for any sort of freight. They will write to their agents in New York for information. Freight from the United States to Europe is always much higher than from Europe to the United States. The reason for this should be evident to anyone who studies basic conditions of trade. The exports from Europe to the United States require much less tonnage than those from the United States to Europe, even when they are of equal value. This is because we ship crude, heavy, or bulky material, while Europe ships lighter materials of more value per pound, such as wines, liqueurs, cigarrette paper, preserved fruits, meats, vegetables, etc., which constitute the chief exports of Bordeaux.

As we do not distinguish in our tariff rates between the ships of different countries, there is always an open competition here, with a constant surplus of freightage obtainable. The existing freight service between Europe and the United States could easily carry twice as much freight as can be obtained. From the United States to Europe, however, there is a perennial shortage of freight accommodations.

Three years ago a man in Chicago cabled me very urgently for cargo rates on wheat from New York to Bordeaux. I cabled the inquiry to London, London cabled New York, New York wired me, and I answered to Chicago. It seems a roundabout way.

ALBION W. TOURGÉE, *Consul.*

BORDEAUX, *March 13, 1901.*

LYONS.

ENGINES IN USE.

About one year ago the following firms, all in Lyons, were doing a good business in the manufacture of gas engines: Gay & Virier (33 rue de Marseilles), Perrin & Cie. (9 rue Robert), M. Mieusset (17 rue du Gazomètre), R. Fournier (1 chemin St. Isidore), and M. Lunant (218 avenue de Saxe).

Within the last year, however, the Jonnage Canal Company, in "a price war," has offered electric power for running machinery at prices so low as to ruin the gas-engine business; consequently, very few gas engines are now made here, these being sold in the surrounding country. Some petroleum and gasoline engines are manufactured here.

The gas-engine men are going into other lines of manufacture which they hope to combine with their old business. They think American dynamos would find a good market here.

FUEL.

Steam coal costs in this market 28 and 30 francs ($5.40 to $5.79) per ton of 2,205 pounds.

JOHN C. COVERT, *Consul.*

LYONS, *September 12, 1900.*

MARSEILLES.

ENGINES IN USE.

There are thought to be about 4,000 gas motors in use in Marseilles, and a considerable number of petroleum motors. The gas engine, in spite of the high price of the fuel, is considered less expensive to operate than the petroleum, and the cost of the machine itself is always less. With coal at present selling for about $10 per ton, it is not impossible that the price of gas may be advanced, in which event both the users of gas and steam engines may be disposed to look more favorably upon the petroleum-consuming devices.

Prices at which motors are offered for sale in Marseilles are:

Horsepower.	Cylindrical diameter.	Gas.	Petroleum.
"Delta" motor (Blackwell):	*Millimeters.*		
½	88	$125.46	$168.87
2	133	262.48	318.45
10	203	791.30	872.36

"Otto" gas, horizontal: 1 horsepower, $318.45; 2 horsepower, $463.20; 10 horsepower, $965. Base, $23.16, $28.95, and $57, respectively.

"Otto" gas vertical, complete: 1 horsepower, $289.50; 2 horsepower, $366.70; 5 horsepower, $772.

"Otto" petroleum: 1½ horsepower, $443.90; 5 horsepower, $772; 10½ horsepower, $1,080.80. Base, $23.16, $38.60, and $57.90, respectively.

Pilter (name of engine not given) petroleum: 1 horsepower, 114-millimeter cylinder, $357.05; 3 horsepower, 140-millimeter cylinder, $472.85; 5 horsepower, 178-millimeter cylinder, $704.45.

Horsepower.	Revolutions per minute.	Weight.	Gas.	Petroleum.
"Gardner" horizontal:		*Kilos.*		
½	450	95	$135.10	$154.10
1	350	150	104.05	183.35
2	300	450	289.50	328.10
20	1,524	3,100	1,389.60	1,592.25
"Gardner" vertical:				
2		250	289.50	328.10
4½		550	182.50	540.40
7½		750	617.60	694.80

OUTLOOK FOR AMERICAN ENGINES.

I have communicated with all the leading dealers and agents for gas engines, with the following results:

D. Moutte & Cie., 2 rue de la Paix, who have a large machine shop for general work, and are dealers in engines as well, have several American gas motors in operation in their plant, and express willingness to take more agencies upon receipt of full measurements and illustrations. They say that the prices of American and English engines, delivered, are much the same, and that the American motor is preferred.

F. Tennevin & Cie., 57 rue de Rome, have American gas motors in their showroom, but profess to believe that the English makes are preferred. They assert that the American motor as a rule lacks the external finish of the English make, although admitting that the British article is not superior in any essential respect. They further say that the English manufacturers offer their wares, freight and duty paid in France at the same prices for which they sell the same article in London.

Lavigne Frères, 77 rue de Rome, are agents for French engines only. They make a specialty of the "Otto" gas engine, which is very popular, and is also manufactured, I believe, in the United States.

Th. Pilter, 78 rue de la République, includes gas and petroleum engines in his catalogue, but has none on exhibition in his Marseilles depot. He is a heavy importer of American machinery, more particularly agricultural implements.

FUELS.

The present average cost of a refined quality of petroleum is $5.11 per hectoliter (26.41 gallons). This includes a tariff of $1.93, but

does not include an octroi, or municipal duty, of 96 cents. Gasoline or "essence," as it is called here, of the grade used for engines and automobiles is now selling at $8 per hectoliter, subject to the same conditions as above.

TRANSPORTATION AND FREIGHT.

Marseilles is a very favorable point for the importation of American machinery of all descriptions, and the quantity arriving is increasing annually. Several direct steamship lines offer every reasonable facility, not only for doing business with the city of Marseilles, but with the Mediterranean and Far Eastern ports, for which this is an excellent point for transhipment. Freight rates are subject to change without notice, and at this moment, the price of $5.46 per 40 cubic feet is quoted on machinery.

ROBERT P. SKINNER, *Consul.*

MARSEILLES, *August 18, 1900.*

NICE.

ENGINES IN USE.

As far as I have been able to ascertain, there are about 150 gas engines in operation in this consular district. They are used in various small industries and in hotels and other public places for private electric lighting plants. They may be considered to be of French or English manufacture, as very few are imported from Germany. With the exception of one make, the English manufacturers have been enabled to undersell the French, and I have ascertained that they have reached this result by offering their engines delivered at Nice, free of all charges and expenses, at less than the prices asked for the French engines.

The prices vary considerably. For instance, one English maker has offered a 30-horsepower engine laid down at Nice for 8,500 francs ($1,640.50). French gas engines of 5 to 6 horsepower have been sold at 3,000 francs ($579), while the same class of English manufacture may be had for 2,500 francs ($482.50) and perhaps a shade less. A French make considered to be very good is sold at from 1,500 francs ($289.50) to 6,000 francs ($1,158) for from 2 to 15 horsepower. An offer was made lately by an English manufacturer to deliver a 70-horsepower engine, all charges paid, for 25,000 francs ($4,825).

SELF-FEEDING GAS ENGINES.

Attempts are being made at present to introduce self-feeding gas engines (moteurs à gaz pauvre), and a gas-producing attachment is being advertised as applicable to all gas and oil motors. This engine,

it is claimed, will run at a cost of but half a cent per horsepower per hour, with English coal costing from 47 francs ($9.071) to 50 francs ($9.65) per ton. The impression is that this type of gas engine should meet with considerable success, especially in those portions of the district not having a supply of either gas or electricity. I should here remark that if the proposition of the Société des Forces Motrices described in my report of August 30 last[1] should be accepted by the municipality, the use of gas engines proper would naturally become more restricted in the city and in the outlying districts through which this company proposes to run its cables. On the other hand, if the "self-feeding" type of gas engine can really be run as economically as is claimed, it would always be able to maintain an active competition with other kinds of power, and especially for small industries.

FUEL.

All kinds of fuel are available in this consular district, and the prices thereof are as follows per 100 liters (26.417 gallons): Crude oil, 15 francs ($2.895); kerosene, 33 francs ($6.369); gasoline, 43.50 francs ($8.299).

At the present time, English coal is being sold at about 47 francs ($9.071) to 50 francs ($9.65) per ton, and the price of gas has been raised lately to 25 centimes (4.8 cents) per cubic meter.

TRANSPORTATION AND FREIGHT RATES.

The facilities for transportation of machinery from the United States are of the best. I regret to be unable to give the freight rates from the United States to this port via Marseilles or Genoa, but I am convinced that in view of the large lines now running to Genoa and connecting with this port, very favorable freight rates may be obtained.

OUTLOOK FOR AMERICAN MACHINES.

I have no idea of the prices now being asked for the different types of gas engines made in the United States, but judging from the low prices and the excellence of American machinery in general, I do not see any reason why our manufacturers should not be able to compete for their fair share of the trade of this district. I suggest, as the best means for doing so, the appointment of a special agent for Nice and its neighborhood, who would be able to receive machines direct by sea and to offer them at a price laid down, cost, freight, and all charges paid.

ATTILIO PIATTI,
Acting Consul.

NICE, *September 3, 1900.*

[1] Printed in Commercial Relations for 1900.

RHEIMS.

One company, La Compagnie de l'Usine à Gaz, de Reims, controls the entire gas supply of this city. It furnishes power to from eighty to ninety gas motors, the largest of not over 6 horsepower.

As far as I can ascertain, they are all French or English machines. They are for sale at the following addresses at Paris: Niel, 22, rue Lafayette; Crossley, agents J. & O. G. Pierson, 54, faubourg Montmartre; Otto, 15, avenue de l'Opéra; 155, rue Croix-Nivert; Lenoir, made by Henri Rouart at Montluçon, agents J. Grimault, 66, quai de Jemmapes; Forest, 76, quai de la Rapée; Duplex, 130, rue Lafayette.

FUEL.

Coal is used to produce all power used in Rheims, but the gas made therefrom is not of very good quality for lighting. The price of coal has advanced 50 per cent during the past two years and it is now selling, per metric ton, 2,204.6 pounds, as follows: Good steaming coal, wholesale, 28 francs ($5.40); coal for heating, retail, 54 francs ($10.42); kerosene, wholesale, per 100 liters (26.417 gallons) 30 francs ($5.79).

Gas has not yet been advanced in price, but may at any time. The company is considering the matter. It is furnished at present at 24 centimes the cubic meter, equivalent to about $1.35 per 1,000 feet.

FACILITIES OF TRANSPORTATION.

For quick transit to this part of France, the route from the United States is by sea to Havre, and from there by rail.

Every department in the consular district can be reached by canal from the seaport of Dunkirk, and for slow transit for bulky or heavy articles, that is the better route.

The freight rate from Dunkirk to Rheims by canal is about $1 a ton.

OUTLOOK FOR AMERICAN ENGINES.

As to whether American manufacturers can compete with the French and English machines, I can not say. To determine that matter requires expert knowledge and a study of the market by persons thoroughly familiar with the subject. Probably, this has been done to a greater or less extent at the Paris Exposition.

WM. A. PRICKITT, *Consul.*

RHEIMS, *October 15, 1900.*

ROUBAIX.

ENGINES IN USE.

During the past few years, the sale of gas engines in this consular district has largely increased. At one time, very few manufacturers employed gas engines. Now, small repairing shops, carpenters, bakers, and even butchers have them to replace hand labor. This is readily understood, as the gas motor has several advantages over a steam engine, viz, it requires no attention, takes up less space, and there is less danger of explosions; it is started almost automatically, cost of fitting is small, and the prices have been so reduced that the engines are within reach of people of small means; and the quantity of gas consumed has been reduced to a minimum. It is estimated that a good engine will consume from 400 to 500 liters (14.12 to 17.65 cubic feet) of gas per hour and per horsepower. The most essential point when fitting an engine is to have a substantial gas regulator, which will not only regulate the flow of gas properly, but increase the life of the engine from 15 to 20 per cent.

The price of gas engines varies according to their make. The average price of the best make of engine, 1-horsepower, is about 1,000 to 1,200 francs ($193 to $231.16).

Gas used for heating and motor power costs from 12 to 15 centimes (2.3 to 2.9 cents) a cubic meter (35.3 cubic feet) in this consular district, but gas companies make a reduction of 20 to 30 per cent to firms that use over 1,000 meters (35,316 cubic feet) per year. The price of gasoline, kerosene, etc., used for motor cars, as well as for engines, is 65 francs ($12.55) per 100 kilograms (220.4 pounds) at the refinery. That of coal used for steam engines, which cost on an average 15 francs ($2.89) a ton two years ago, has now risen to over 30 francs ($5.79). These high prices have created a large demand for gas engines.

There are several very good makers of gas engines in France. As a rule, however, the engines come from England, and a few from Belgium and Germany.

The principal dealers in gas engines for this part of France are the following: Berthier-Waltel, rue Belle Vue 33; Blandin & Castel, rue Nationale 61–78; E. Declercq & H. Cordonnier, rue Jean Roisin 5; A. Dugauquier, rue Deschodt 13; C. Madurel, rue Ponts de Commes 48; R. Villain, rue des Rogations 38—Lille, Nord.

OUTLOOK FOR AMERICAN ENGINES.

The manufacturers of gas engines should bear in mind that when they ship a machine to France, they should ship to a French port, because if sent through a foreign country the French customs enforce an additional duty of 3 per cent. The nearest port which serves this district is Dunkirk.

The best means of introducing American engines into France is to employ a good agent who understands the engine thoroughly.

It would be advisable when quoting prices to state price of engine delivered in French ports. This is one reason of the success of the English and German gas engines in France.

W. P. ATWELL, *Consul.*

ROUBAIX, *August 22, 1900.*

ST. ETIENNE.

ENGINES IN USE.

Gas engines are much used and appreciated in all the small industries of the country. In this town alone, over 300 are employed, and although the applications of electricity as a motor power are becoming every day more perfected, that agent will never constitute a serious obstacle to the development of the gas engine. The latter possesses advantages which are not obtained from electricity. For instance, it is cheaper, after first cost, in its working (3 cents per hour for machine of 5 horsepower); when idle, no gas is used; rarely gets out of order, and is unaffected by atmospheric disturbance. The working expenses of the electric motor of 1 horsepower amount to 5 cents per hour; there is little saving of expenses when idle, while the current is liable to frequent interruptions from various causes, among others from thunderstorms. I have known those who had electric motors to abandon them in favor of the gas engines.

The prices of gas engines naturally vary with the amount of horsepower.

Horsepower.	Length.	Width.	Diameter of pulley.	Price.
	Meters.	*Meters.*	*Meters.*	
1	1.350	0.700	0.250	$280
2	1.480	.760	.300	340
3	2.000	.910	.350	460
4	2.000	.950	.400	520
5	2.100	1.100	.500	660
8	2.200	1.200	.650	840
10	2.450	1.250	.700	900

The prices of petroleum engines are a little higher. As regards the source of supply, gas engines are manufactured more or less in every department of France, but the Otto engine, constructed at Paris, is the best known and the most freely advertised. However, an English firm, Crosseley, of Manchester, exports a good many, and they are considered superior to the French make; several of these are in use in this district.

OUTLOOK FOR AMERICAN ENGINES.

I am convinced our home constructors can compete efficiently with any of the French or foreign houses. A good future for these engines

for all industries is apparent for the following reasons: Coal is undergoing a crisis in France which provokes evil forebodings in many minds. Not only has it gone up in price, but it is scarce. The coal companies are obliged to refuse coal to anyone outside their own customers. Contracts having been made, engagements must be kept, so that, under ordinary circumstances, the combustible is very difficult to get here, although this city is in the center of the coal beds of the southeast of France.

The price of gas, on the other hand, will not follow the ascending scale of the coal prices, as the gas companies can get their profit out of other products of the coal, such as coke and liquid ammonia, coal tar, etc. The price of gas for engines here at present is 4 cents per cubic meter (35.3 cubic feet), representing a cost of 3 cents per hour for an engine of 5 horsepower. I have heard the gas company intends to lower the price in a short time to 3 cents per cubic meter. In any case, those who use the engines have told me that they are well satisfied with them and that they will be more extensively employed.

FUEL.

The actual price of coal used for steam boilers is from $3 to $5 per ton, according to the quality. When I went to one of the largest coal mines here for information on the point, I was told that I would be given the prices readily enough, but not the coal, as there was none to sell. Such is the state of affairs in this region.

I might say that nearly all the petroleum used in Farnce comes from Pennsylvania in the crude state. Russia has begun to export her oil hither, but up to the present it does not amount to much.

The cost of ordinary petroleum here is 9 cents per liter (1.0567 quarts), or, if taken by the cask of 200 liters (211 quarts), 7 cents. The extra refined oils are termed here oriflamme, luciline, saxéoline, etc. The equivalent of our gasoline is sold at 10 cents per liter, while the price of moto-naphtha for automobiles is 12 cents per liter.

TRANSPORTATION AND FREIGHT RATES.

The most direct routes from the United States to St. Etienne would be via Havre or Marseilles, more especially the latter. Marseilles is about 350 miles from St. Etienne, and Havre 700 miles. It is true that the sea route is shorter to Havre, but perhaps that fact has not much importance for freight vessels.

As gas engines come under the head of machines in general packed in cases, the railway charge for freight from Marseilles to St. Etienne is $6.60, and from Havre to St. Etienne $10 per ton.

HILARY S. BRUNOT, *Consul.*

ST. ETIENNE, *September 19, 1900.*

GERMANY.

ENGINES IN USE.[1]

Under the generic title "gas engines" are included by common usage all motors in which the fuel—whether illuminating, generator, blast furnace, water or natural gas, oil, benzine, gasoline, or other form of spirit—is burned inside the cylinder instead of in or under a boiler for the purpose of generating steam.

The fundamental idea of the gas motor, that of driving an engine by a series of explosions operating against a piston, is probably as old as the steam engine, but its first really practical application dates from the Lenoir gas engine, which appeared in 1860. In this machine, a mixture of gas and atmospheric air was drawn into each end of the cylinder during half the alternating piston stroke, at which point the valves closed automatically, and at the end of the stroke the mixture was ignited, producing an explosion which drove the piston forward with great force. The engine developed a high efficiency in respect to power and ran smoothly, but consumed so much gas that under ordinary conditions it could not compete economically with steam.

The next step which made the success of the gas engine is said to have been suggested by De Roches, a French engineer, but was developed in Germany by Otto, whose name was given to the "Otto cycle," upon which principle most economical gas engines now operate. This invention dates from 1876, and was the foundation of the development which has made Germany the home of the gas engine. The principle of the Otto cycle is as follows: The engine is, with few exceptions, single acting—that is, the power is applied only on one side of the piston—the end of the cylinder nearest the crank shaft being open and the connecting rod geared directly to the piston itself. When the piston is at the farther end of the cylinder, an automatic inlet valve

[1] *Duty on gas machines entering Germany.*—On account of the very complicated nature of the German tariff, the consuls differ as to the duty imposed on gas engines. Consul-General Cole, of Dresden, and Consuls Hughes and Webber, of Coburg and Nuremberg, say the German duty on machines is 8 marks per 100 kilograms ($1.90 per 220.46 pounds). Consul Schuman, of Mainz, says that gas engines would probably pass customs as machinery at 3 marks per 100 kilograms (71.4 cents per 220.46 pounds). Consul Pitcairn, of Hamburg, says the customs duty on machinery of such material as gas engines are made of, is as follows per 220.46 pounds: On cast-iron parts, 3 marks (71.4 cents); wrought-iron parts, 5 marks ($1.19); brass (red brass, etc.) parts, 8 marks ($1.90). Duty on iron parts is charged on gross weight.

The following is the German tariff on machinery as compiled from Special Consular Reports, Tariffs of Foreign Countries, volume 16, part 1, page 235:

Machines, per 220.46 pounds: (1) Locomotives and portable engines, 8 marks ($1.904); (2) other machines, according to the preponderating material: (*a*) Of wood, 3 marks ($0.714); (*b*) of cast iron, 3 marks ($0.714); (*c*) of wrought iron, 5 marks ($1.19); (*d*) of other common materials, 8 marks ($1.904).

opens, and as the piston is drawn forward by the momentum of the fly wheel, a vacuum is created, into which is sucked a mixture of gas and atmospheric air. At the end of the outward stroke, the inlet valve closes and the returning piston compresses the contents of the cylinder, which, at the end of the return stroke, are exploded by a flame or electric spark, which drives the piston forward and creates the power developed by the engine. At this point, an escape valve opens and the returning piston expels from the cylinder the gases produced by combustion, and the "cycle" recommences at the following stroke. It follows, therefore, that only one stroke in four is really effective; that the speed of the engine is maintained during the other three by the fly wheel, which must be large and heavy in proportion to the size of the motor. Moreover, the engine itself, being subjected to powerful though regular explosions, must be strong and heavy in all its parts, and must besides be started by exterior means, either by hand or, in the case of large engines, by a "starter" specially designed for the purpose.

Against these latter obvious disadvantages there are to be reckoned, first, the economy of applying the energy stored in fuel directly to the load, instead of by the roundabout and wasteful process of evaporating water, with all the other attendant losses from radiation and the exhaust steam when it escapes into the air or is condensed into water. This difference is measured by the fact that whereas the best modern compound steam engine utilizes only 10 to 12 per cent of the energy stored in the fuel, gas engines reach an efficiency of 25 to 28 per cent. In other words, while a pound of coal converted into gas and burned in a good motor will yield 1 horsepower hour, the best steam engine will consume 2 pounds for the same result, and in many steam engines without condensers, the consumption reaches from 4 to 5 and 6 pounds of coal per horsepower hour.

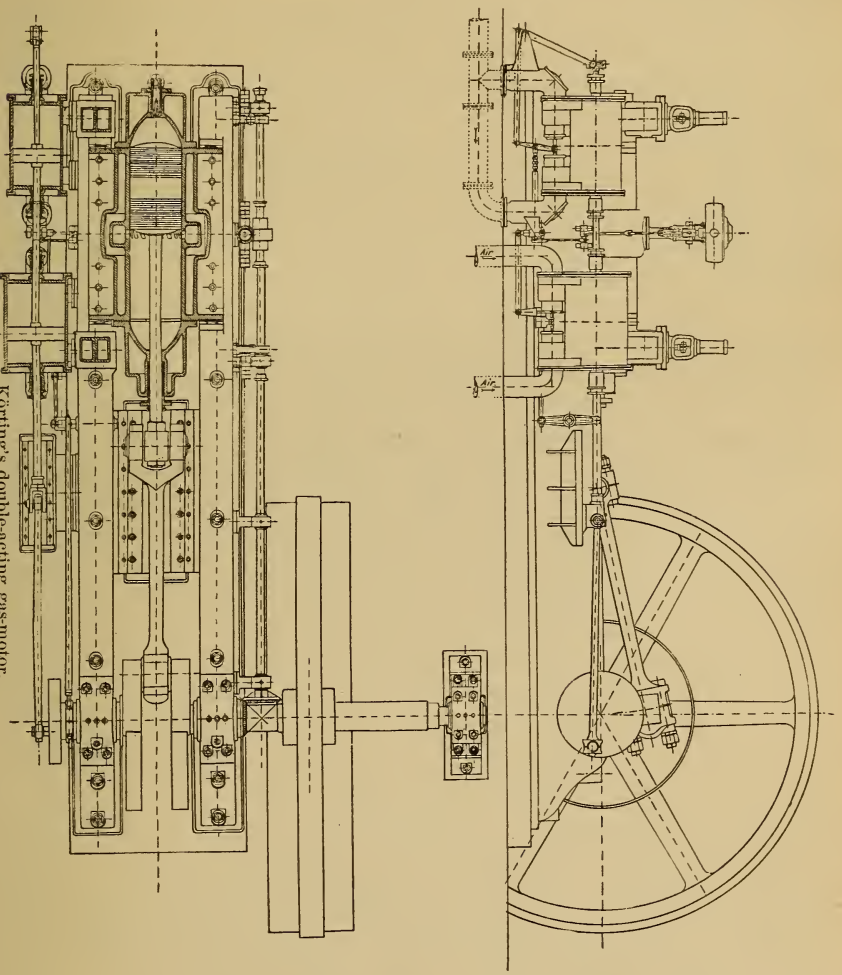
The other important advantages claimed for gas motors are their economy of space, the entire elimination of boiler and furnace, with their attendant smoke, dirt, danger, and space occupied, including the tall and costly chimney, and, finally, cheapness and simplicity of attendance, for a gas engine, well built and in good order, requires practically no attendance and can be cleaned and cared for by an ordinary workman.

The original Otto patents expired about 1890, and since that time, as well as before, the manufacture and use of gas engines have increased until there are now in this country not less than thirty manufacturers of such motors, and during the twenty years from 1877 to 1898, 1,356 patents were taken out for improvements in different details of construction.

The present importance of gas-engine manufacture and use in Germany will be best indicated by a brief statement of the business of two

or three of the leading makers. Of these, the first in point of age, experience, and extent and variety of its productions is the Otto Gas-Motor Company, at Deutz, opposite Cologne, where the business was established thirty years ago and has expanded until the company has branch factories at Philadelphia, Milan, Paris, Liege, and Copenhagen.

It has made and put into service 55,000 motors, with an aggregate



Körting's double-acting gas-motor.

working energy of 260,000 horsepower and ranging from the one-half-horsepower machine run with kerosene, gasoline, or illuminating gas, to ponderous two and four cylinder engines of 1,000-horsepower, which use the hitherto wasted gas of blast furnaces.

The second place among German makers belongs to the Brothers Körting, at Körtingsdorf, near Hanover, where they opened business

about twenty years ago, and have since built and sold between 5,000 and 6,000 motors, of which about 800 are in service in foreign countries, the remainder in Germany. This firm makes also large engines of modern type, up to 1,000-horsepower, for the utilization of blast-furnace gas, and their list includes motors of all sizes, from one-half horsepower upward, specially adapted to the use of illuminating or generator gas, benzine, oil, and spirits.

The Daimler Motor Company at Cannstadt, near Stuttgart, manufactures by thousands the Daimler engine, which is the leading hydrocarbon motor for automobile wagons and carriages.

Finally, the Diesel heat motor, the most recent and advanced type of oil engine, was invented by an engineer at Munich, and is manufactured by several establishments in this country, the pioneer of which was the "Augsburger Maschinen Fabrik," at Augsburg. This engine was described in a former report of this series, published in Consular Reports No. 208, January, 1898, pages 21–25.[1]

In no other country, with the possible exception of Belgium, has the heat motor of various types played so important a part as here in the development of small industries—the minor forms of manufacture, which are carried on by a large class of men, either independently or as adjuncts of large factories for which they work by the piece—as in the file and cutlery manufacture in and about Solingen, Remscheid, and other towns in the Lower Rhine region. For these purposes, the advantages of the heat motor over every other power-creating device are so decisive and obvious, that the Imperial Government has suggested and advocated a plan by which such motors shall be made available for rent, at the cheapest possible rate, to workingmen and small manufacturers, who, by reason of restricted means, are unable to purchase them outright. The gas motor is the sheet anchor of the "small industries," which have done so much for the prosperity and progress of Germany. As an example of its economy, a case is cited where a gasoline motor of 7½ horsepower was adopted at the beginning of the present coal famine to work a small cloth mill in a district remote from the nearest coal mine, where all transportation was by rail and unusually expensive. The steam engine had consumed half a ton of coal per day, which cost $2. The engineer-fireman had a salary of $25 per month, so that coal and attendance cost, approximately, $3 per day. The gasoline motor does the same work with 80 cents' worth of spirit and 10 cents for attendance and cleaning, or 90 cents against $3—an economy of $2.10 per day.

The prices of gas motors vary somewhat in accordance with the quality of gas to be used and other conditions, but their general range

[1] As the edition of this number is exhausted, a reprint of the report referred to is annexed. See p. 51.

will be closely indicated by the following schedules, which do not include the bedplate on which the motor rests:

Description.	Horse-power.	Weight.	Price.
		Pounds.	
Otto's new vertical motor, single cylinder, model D2	½	748	$190.40
	1	1,078	238.00
	2	1,496	309.40
	3	1,936	380.00
	4	2,640	452.00
Otto's new horizontal motor, single cylinder, model E3	1	968	245.00
	3	1,784	392.00
	6	2,750	630.00
	10	5,368	714.00
	16	7,480	1,142.00
	20	9,240	1,487.00
	30	11,220	1,666.00
	50	21,120	2,618.00
	80	30,800	3,332.00
Körting's horizontal, single cylinder, model M	20	7,392	1,520.00
	30	11,000	1,855.00
	40	16,500	2,570.00
	50	22,000	2,832.00
	60	26,180	2,903.00
	80	36,080	3,903.00
	100	48,400	5,117.00
	125	56,100	6,069.00

The prices for Körting engines for dynamos for the horsepower given are $1,570, $2,000, $2,689, $3,000, $3,570, $4,183, $5,355, and $6,378, respectively.

These prices, from the two leading manufacturers, cover the range of standard single-cylindered gas motors from one-half up to 125 horsepower. The larger machines, usually made under specifications for a certain service and position, are specially adapted to the fuel to be burned. This may range anywhere from generator and blast-furnace gas, containing only 28 thermal units (calories) per cubic foot, to illuminating gas, with 167 calories in the same cubic measure, and for this wide variation, provision must be made in the reservoirs, ports, and valves which contain and regulate the supply and proportions of gas and atmospheric air.

NEW IMPROVED ENGINES.

From the nature of the case, an engine in which the power is applied to only one side of the piston, and which receives but one impulse in every four strokes or movements of the piston, must needs carry a very heavy fly wheel and be itself throughout inordinately heavy in proportion to the power developed. These disadvantages become increasingly noticeable when motors operating on the principle of the Otto cycle are built for loads exceeding 50 to 60 horsepower. But as modern requirements, particularly for driving dynamos and utilizing the hitherto wasted off gases of blast furnaces and coke ovens, demand motors of from 500 to 1,000 horsepower, there has been developed in Germany a group of new and highly improved engines, which are, in respect to mechanical ingenuity, economy of operation, and technical

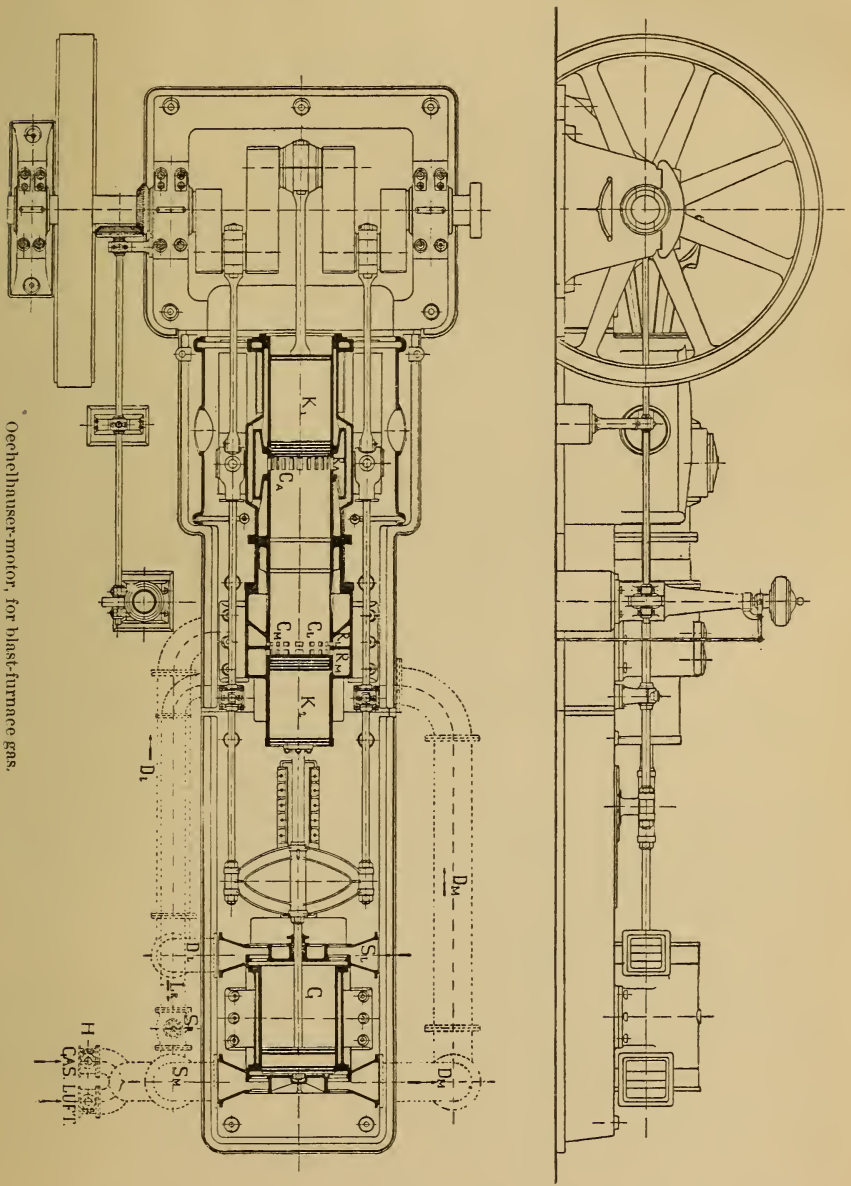
interest, so far in advance of all preceding types that they claim special description in a report of this character.

For the purpose of illustration, two of the new engines will be chosen, which may be accepted as representatives, each of its special class. The first is a 400-horsepower engine, built by the Brothers Körting, which has been in operation at their works in Körtingsdorf for a year or more past, and in May last was carefully tested by an expert commission headed by Mr. F. W. Lührmann, an eminent German engineer, whose report describes the motor and the results demonstrated by the test. The construction and operation of the motor will be readily understood from the accompanying diagram,[1] which shows it to have one long cylinder closed at both ends by cylinder heads curved outward, so as to form combustion chambers, and surrounded with cold-water jackets. A crank or eccentric on the main shaft works two pumps, placed tandem horizontally beside the cylinder. One of these pumps compresses and injects into the working cylinder fresh air, which expels the burned gases of combustion at the end of each stroke, cools the cylinder itself, and leaves it filled with fresh air at normal pressure. The other pump, working on the same piston rod, injects at the right moment the gas, which, mingling with the air already in the cylinder, forms the explosive mixture which, being compressed by the returning piston and ignited, explodes and gives the motive impulse to the machine. From the report of the commission, it appears that the cylinder is of 22 inches diameter, with 38½-inch piston stroke; that the fly wheel weighs 8,000 kilograms (17,600 pounds), and that at a speed of 100 to 110 revolutions per minute, it ran smoothly and developed from 360 to 410 effective horsepower. The effective power developed was measured during the experiments with an electric brake, which was thought to give an unduly low and unfavorable result. The fuel used was illuminating gas, the consumption 1,635 cubic meters (57.74 cubic feet) per indicated horsepower hour, and the indicated efficiency 37.9 per cent of the total thermal value of the fuel. This engine can be adapted to the use of generator, blast furnace, coke oven, illuminating or water gas, can be made of any size from 100 to 500 horsepower, and, according to the report, does not exceed in weight a steam engine, with its condensing apparatus, of equal effective power.

The second machine, which is here described with sectional diagram, is a double-acting motor, specially adapted for the use of blast-furnace gases, and is built by a special combination of the Union Electrical Company, of Berlin, with Messrs. Siemens & Halske under the name of the "German Power-Gas Company." This engine, which represents the latest and most advanced standard of German construction, is known as the "Oechelhaeuser motor," and is built up to 2,000

[1] See p. 43.

effective horsepower. Its distinctively original feature is that instead of one piston propelled from one or both sides by explosive pressure, it has two pistons, working in one long cylinder of uniform bore and geared by connecting rods to cranks set at 90° on the same driving



Oechelhauser-motor, for blast-furnace gas.

shaft. Thus arranged, the mixture of gas and air is introduced between the two pistons and its expansive force in both directions utilized instead of being half wasted against a solidly fixed piston head.

The mechanical contrivance for securing this result will be readily understood from the diagram. The main direct-acting piston K_1 deserves no special description or comment. The secondary piston K_2 works to the farther end of the cylinder on a piston rod with a crosshead, connected by double driving rods with cranks on the main shaft. From the crosshead, the piston rod extends on into a second or auxiliary cylinder which serves as a double-acting pump for injecting alternately air and the air and gas mixture into the combustion chamber of the main cylinder. The driving shaft receives therefore all the power exerted through the main piston, and all the surplus force exerted by the secondary piston above what is required to work the air and gas pump.

The main cylinder is incased in water jackets, and the arrangement of ports and valves is such that at the end of each outward stroke, an exit is opened at the same moment as an inlet of air which sweeps the interior clear of burnt gases, cools the cylinder, and is ready for combination with the gas and air mixture which enters through the valve C_m in time to be shut in and compressed by the returning pistons to the point where it is ignited for the succeeding stroke. Both pistons are of the trunk type and close or open the inlet ports of the cylinder as they slide back and forth, the movements of both pistons being in exact and carefully calculated relation with that of the piston and valves in the blowing cylinder G, which regulate the supply of air and of the mixture of gas and air which enters at H, where the proportions of the two ingredients are controlled by a suitable device.

BLAST FURNACE GAS MOTORS.

So far as can be ascertained, motors approximating in character the foregoing type for the use of blast-furnace gas are in use by the steel and iron company at Hoerde in Westphalia, and at three other furnaces in Germany, as well as the John Cockerill works at Seraing, Belgium. The German power gas company has in construction at its works in Aschersleben under definite contracts, fourteen motors with an aggregate capacity of 12,000 horsepower, so that the general adoption of this important economical improvement by the more progressive German ironmasters may be regarded as assured.

From the report of the German Ironmasters' Association at its meeting on April 23 last, it appears that no furnace in Germany is yet entirely equipped with gas motors so far as to wholly dispense with steam or other power, and as the net efficiency of such an equipment must depend somewhat on the quantity of gas available and the character and arrangement of the plant, no precise and ultimate standard of economic efficiency has yet been established. But in case of one furnace which also utilizes partially the offheat gas from its neighboring coke ovens, it has been found that with a consumption of 3.5 cubic meters (122 cubic feet) of gas per horsepower hour, an effective force of 7,140 horsepower can be developed.

From the experience at Seraing, Hoerde, and elsewhere in Germany it is estimated that under European blast furnace practice, there is generated on an average about 4,600 cubic meters of furnace gas for every ton of pig iron produced, and that with proper construction and machinery, about 2,250 cubic meters (78,750 cubic feet) of this should be available for motor purposes. Assuming that Germany produces annually about 9,000,000 tons of pig iron, or 24,650 tons per day, it is calculated that if all surplus blast-furnace gas were utilized in motors of the best present construction, there would be saved to German industry an aggregate motive force of 542,300 effective horsepower. The conditions under which the iron and steel makers of this country will have to meet the future competition of the United States invest the whole subject with immediate and urgent interest. Against the superior and cheaper ores, coal and coke of America, Germany can oppose only the highest scientific theory, consummate technical skill and an enterprise which will not stop short of any improvement that can promote economy of material and excellence of product.

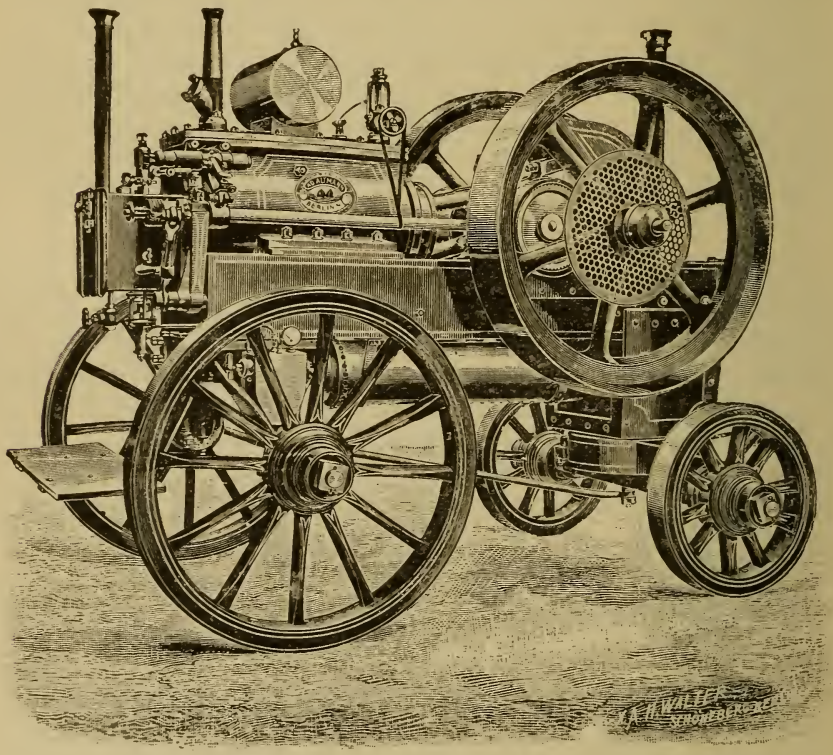
SPIRIT MOTORS.

Another interesting feature of this general subject is the marked tendency during recent years toward the use of alcohol motors for portable and stationary engines of moderate power, especially when designed for thrashing, straw cutting, cider making, and other agricultural purposes. When, some months ago, the question of adopting motor carriages for military purposes was under discussion, it was suggested by the ministry of war that kerosene, benzine, and gasoline motors were open to the objection that they required as fuel the products of petroleum, which is not produced in Germany, and the supply of which might, in case of war, be cut off.

It was therefore urged that Germany should consider the adoption for this purpose of alcohol, which is produced in large quantities by farmers in this country from potatoes, and, by thus using a homemade product, give a new encouragement to agriculture and render military vehicles independent of imported fuel. This gave a new impetus to an already accepted idea, for the alcohol motor had already won a definite place in German industry, and is made by several leading manufacturers, including the Otto Company at Deutz, whose price list for the various sizes from 1 to 30 horsepower is as follows:

Horsepower.	Weight.	Price.	Horsepower.	Weight.	Price.
	Pounds.			*Pounds.*	
1	1,100	$333	10	5,500	$1,000
2	1,540	404	12	5,670	1,082
3	1,936	500	16	7,216	1,309
4	2,420	583	20	9,240	1,500
8	4,290	850	30	11,240	1,904

During the past few months, there has been brought out the "Altmann motor," a new spirit engine of notable simplicity and high efficiency, which is made by the Motor and Motor-Carriage Company at Marienfelde, near Berlin. It is thus far used specially as a portable engine for thrashing machines, and as such was recently tested by a Government official at Platzig, with the following result, which is attested in an official report dated September 19. The machine was an Altmann horizontal, single-cylinder alcohol locomobile of 12 nominal horsepower, working a thrasher built by F. Richter & Co. at Rathenow. It ran one hundred and twenty and three-fourth hours, consumed



Alcohol locomobile, Altmann's patent (Motor-carriage and Motor Company, Marienfelde-Berlin.)

715 liters (188.8 gallons) of alcohol, and thrashed 3,975 bushels of wheat, oats, and rye. This was at a rate of something less than 6 liters (6.34 quarts) of alcohol per hour, and as alcohol of the grade used for this purpose costs only 5 cents per liter, the whole cost of fuel for the run was $35.75, or 29.6 cents per hour. The average speed was 220 revolutions per minute, the mean efficiency 12.88 effective horsepower throughout the test, and the power generated 82 per cent of the total energy of the fuel. Among the advantages of alcohol for motor purposes is its cleanliness, absence of disagreeable odor, comparative

safety, its cheapness, and ready availability in agricultural districts remote from water power, coal, or petroleum supply.

It will be readily inferred from the foregoing statements that the German market for gas motors of all kinds and sizes is well supplied, and that little opportunity is offered for any imported motor which is not cheaper in first cost, more economical in service, and definitely superior to those manufactured so abundantly in this country. Notwithstanding the rapidity with which they are replacing steam engines for all loads under 50 horsepower, the number manufactured is so great and competition between makers so sharp, that agents and dealers assert that profits, especially during the recent period of costly iron and steel materials, have been narrow and uncertain.

FUEL.

The present prices of the various forms of fuel for gas and steam engines in Germany are abnormally high. Especially is this true of coal, so that the economy of gas motors in comparison with steam is still further emphasized. The price test is as follows per 100 kilograms (220.46 pounds): Kerosene, Nobel's Russian, specific gravity 0.823, $5.35; Meteor brand, $5.47; benzine, $9.52 to $10.47; crude petroleum, Russian, $4.28.

City gas in Berlin, 2½ cents per cubic meter (60.7 cents per 1,000 feet); good Silesian steam coal (at Berlin), $6.23 per ton (average past four years, $4.50); denaturized alcohol, 90°, 20 cents per gallon.

Illuminating gas, when used in Berlin for lighting purposes, costs 4 cents per cubic meter (35.316 cubic feet), but the same gas, when used for motor, cooking, or heating purposes, is furnished at 10 pfennigs, or 2½ cents, per cubic meter, and this is the average price in all principal German cities. Generator ("producer") gas is generally made on the premises for motor use in an apparatus closely resembling the Dowson generator, and varies in cost with the price of nonbituminous coal and coke, which are now abnormally high. The only really successful fuel for this purpose appears to be anthracite coal.

FRANK H. MASON,
Consul-General.

BERLIN, *September 28, 1900.*

A NEW CALORIC MOTOR.[1]

On the 16th of June last, before the congress of German engineers at Cassel, Mr. Rudolf Diesel presented an elaborate scientific description and history of his new "rational caloric motor," an invention which so eminent an authority as Professor Schröter indorses as a scientific triumph, and which, in the opinion of many expert engineers who have since studied and tested it in operation, marks an era in the progress of thermodynamics.

[1] Reprint from Consular Reports No. 208.

It is well known that the steam engine, after its inestimable work during the past century, and with all the improvements that it has undergone within recent years, is still, from a scientific standpoint, a wasteful and imperfect motor, which utilizes only a small percentage of the energy stored in the fuel that it consumes. Competent authorities estimate that an ordinary high-pressure steam engine utilizes only 5 per cent of the value of its coal. A Corliss engine of the best modern type may reach an efficiency of 8 per cent, while a triple-expansion engine of 1,000 horsepower or more, with condenser and perfected cut-off, does not surpass 12 to 13 per cent, which is the maximum economic achievement of the steam engine at its present stage of development. The remaining 87 or 88 per cent of the fuel is wasted in imperfect combustion, the costly evaporation of water by radiation at every point, and in the heat that escapes with the exhaust steam after it has done its work.

Nearly a century ago Sadi Carnot, the eminent French engineer, formulated and described in theory a perfect engine, and his specifications, embodied in text-books on thermodynamics, have formed the guide and goal of modern students of that science.

Fifteen years ago Mr. Rudolf Diesel, then a young engineer at Munich, took up the task which he has carried so far toward success as to produce a motor which, with oil or coal gas, utilizes from 28 to 30 per cent of the fuel consumed.

The problem had been to condense the essential elements of the motor, shorten the distance between the point where the combustion took place and the generated energy was applied, to eliminate the costly and cumbrous evaporation of water, the waste of exhaust steam, and the loss from condensation and radiation. Progress along this line had already developed the gas motor, of various but substantially similar types, in all of which gas, mixed with atmospheric air, is exploded by ignition inside the cylinder. Within certain limitations, the gas motor has been reasonably successful, especially for machines not exceeding 50 horsepower, but it has the serious defect that the maximum expansive force is created as a sudden explosive shock at the moment of ignition, causing a heavy momentary strain upon the machinery, followed by a decline of the expansive energy as the piston recedes at each successive stroke. This inherent defect in the gas engine pointed the way to a new and higher type of motor, in which boilers, coal bunkers, and water should be eliminated, and the fuel burned within the cylinder, not by artificial ignition and explosion, but by spontaneous combustion with slower expansion, like the action of slowly burning smokeless powder upon the projectile in a long and closely rifled gun. It is because the new Diesel motor is believed to have met this fundamental requirement to a degree hitherto not attained by any other device that its advent has been hailed as the beginning of a new chapter in the application of heat as a motive force to the requirements of industry.

After more than ten years of study and experiment, Mr. Diesel published, in 1893, a brochure, in which he announced the cardinal principle upon which his invention is based—the ignition of the fuel within the cylinder by means of heat spontaneously generated by mechanical compression of atmospheric air. His demonstration was so convincing that a combination was thereupon formed between the inventor and an important manufactory of machinery at Augsburg, through which working models were built and operated, and the inventor supplied with means for further experiments.

The first practical Diesel motor built at Augsburg was one of 12 horsepower, which ran with entire success until it was superseded by another of 20 horsepower, improved in several details, and which, after eight months of constant service, is conceded to have fulfilled every claim and promise of its inventor.

Omitting all scientific technicalities, the new motor may be concisely described as a gas engine somewhat similar in outward appearance to the ordinary type, but more compact and heavier, since the enormous pressure under which it operates requires great solidity and strength in all its parts. The piston is long and of peculiar construction, having a countersunk recess in its outer face. The machine is so constructed

that at the end of the outward stroke of the piston compressed air is admitted to the cylinder, and, at the same moment, the fuel, in the form of petroleum or coal gas, is injected in the proper quantity. The piston, returning with the momentum of the fly wheel, compresses the already partly condensed air to a density of 35° atmospheric, generating by such compression a temperature of about 1,200° F., sufficient to instantly ignite the fuel, which burns with a slow but powerful expansive force—500 pounds to the square inch—that drives the piston outward until the pressure is released by an opening valve at the end of the stroke. Thus far the energy has been applied to but one side of the piston, the forward end of the cylinder being open, as in the ordinary gas engine, but there is no apparent reason why the same process can not be represented in both ends of the cylinder, and it is confidently expected that a double-acting horsepower Diesel motor will be the crowning feature of the German exhibit at the Paris Exposition of 1900. The cylinder is inclosed in a water jacket, which maintains a moderate temperature and wholly averts the deterioration of the interior working surfaces that is caused by the action of superheated steam. From this brief description it will be seen that Ericsson, in the construction of his engine, was on the right road, but he was not educated in the science of thermodynamics, as it is understood to-day, and by applying the heat outside the cylinder, missed the essential point that could alone secure success. From the verbal account of an eminent American engineer, who came specially to Germany for the purpose and has spent the past fortnight at Augsburg studying and testing the 20-horsepower motor in operation there, it appears that the machine is compact, runs almost noiselessly and without shock or jar, and after eight months of service shows better results than when first put in operation. The Diesel motor has been patented in all countries where patents are granted for inventions, and the rights for France and Great Britain have been sold, while those for the United States are under negotiations which will probably be closed before this report may appear. In France, important works are being established at Bar-le-duc for the manufacture of the new motor. In England, a motor of 250-horsepower is being built for marine use, it being expected that the suppression of boilers, coal bunkers, and condensing apparatus, combined with a motive force of 500 pounds per inch, will enable the new motor to revolutionize the machinery of torpedo boats and destroyers, if not ultimately that of all seagoing war vessels, since its use will, among other advantages, allow water-tight bulkheads, which must now be kept open for the passing of coal, to be kept closed indefinitely when a ship is in action or danger.

Thus far the fuel used has been mainly petroleum; but it has been demonstrated that common illuminating gas is a perfect material for this purpose, and the use for producer gas at American prices would, it is estimated, furnish power at half the cost of steam generated with coal costing 80 cents per ton. At Nuremberg, Diesel motors are being built for street and railroad cars, as well as for a motor tricycle, it having been demonstrated that for the latter purpose this device occupies but one-third of the space of an ordinary petroleum motor. The Otto Gas Engine Company at Deutz is building a number of Diesel engines for use in Germany, and in May next all German makers of the new motor will hold at Munich a joint exposition to exhibit what they may have accomplished toward its improvement. So many inventions have been made, patented, and announced as likely to supersede the steam engine, that claims like those now put forth for the Diesel motor will naturally be received with some incredulity. It remains, therefore, to be simply stated that it has been examined and approved by scientists like Lord Kelvin, in Great Britain, and by Professor Schröter, who, since the retirement of Dr. Zeuner, is the foremost authority on thermodynamics in Germany. Expert commissions from all civilized countries, including notably Japan and Australia, have come to Augsburg to examine the new motor, and have added their testimony to the general verdict in its favor. American engineers who are unable to make such a journey, but to whom the subject is of practical interest, will find the history and scientific theory of Mr. Diesel's invention

elaborately presented (with drawings) by the inventor in Nos. 28 and 29 (July 10 and 17, 1897), of the Zeitschrift des Vereines Deutscher Ingenieure, and in No. 30 of the same publication, the deliberate verdict of Professor Schroeter, who, after a masterly analysis of the theory of the motor, closes with the following tribute:

"In this report, which I hope to complete by further exhaustive thermodynamic studies, there is a confirmation of the conviction already conveyed by the discourse of Mr. Diesel, that we have here to do with a practicable machine, complete in all its parts. That in the short space of three years the conception of the inventor has found such full realization is a triumph which can be ascribed only to the combination of thorough scientific knowledge with the untiring energy and constructive skill that have overcome all difficulties."

FRANK H. MASON, *Consul-General.*

FRANKFORT, *October 11, 1897.*

BAVARIA.

ENGINES IN USE.

Gas engines are largely used in Bavaria. In the city of Nuremberg alone, there are 473 in use. All these are of German make. The Deutz gas engines of the Gasmotorenfabrik in Deutz, near Cologne, govern the market. About 400 Deutz gas engines are in use here.

Another German engine which has some sale here is the Hille gas motor of the Gasmotorenfabrik in Dresden. About 50 of these are in use in this city.

Efforts to introduce German gas engines of various other makers have met with but little success.

Of late years, gas engines in connection with self-making gas apparatus (generator gas engines) are also much sold in Bavaria, especially at places where there are no gas works or where gas is very expensive. Both the Deutz and the Dresden Gasmotorenfabrik make these engines for either anthracite, coke, or benzine. Other materials than these are not used in my consular district for such purposes.

The present anthracite, coke, and benzine prices are as follows: Anthracite, about $6.50 per ton; coke, about $7.60 per ton; benzine, $4.85 per 100 pounds.

The generator gas engines are said to work very cheaply. The entire consumption of fuel of the Deutz gas engines both for generator and boiler is only 1.102 to 1.322 pounds per 1 horsepower per hour, if the gas is made from anthracite, and 1.543 to 1.984 pounds if the gas is made from coke.

Gas engines which are driven by gas made by the above-mentioned materials are, as a rule, the same as those driven by illuminating gas supplied by gas works.

Lighting gas for industrial purposes is very cheap in this city; it costs only 2.86 cents per cubic meter (35.316 cubic feet), while at Munich, the capital of Bavaria, the gas works charge 5.47 cents per cubic meter.

OUTLOOK FOR AMERICAN ENGINES.

A good American gas engine might find sale here, provided our manufacturers were willing to make sacrifices at the beginning as regards prices, commission for agents, etc.

Firms which may be addressed with a view to introducing American engines into Bavaria are: H. Rosenbaum and Richard Brass, both of Nuremberg. They are now large importers of American woodwork and metal-working machines.

TRANSPORTATION AND FREIGHT RATES.

Our manufacturers should quote their prices f. o. b., New York. The machines should be packed carefully in wooden cases and shipped by steamer to Rotterdam, thence on the Rhine to Frankfort or Mannheim, and thence by rail to Bavaria.

The freight rate from Rotterdam to New York on this class of merchandise is $5, either per cubic meter (1.308 cubic yards) or per 1,000 kilograms (2,204.6 pounds), at the option of the steamship line; vice versa, from New York to Rotterdam it is about the same.

Freight from Rotterdam on the Rhine as far as Frankfort and thence by rail to Nuremberg is 33 cents per 100 pounds.

GUSTAV E. C. WEBBER, *Consul.*

NUREMBERG, *October 26, 1900.*

BRESLAU.

ENGINES IN USE.

There are no gas-engine factories located in this consular district, but I am informed that there are such factories in Köln-Deutz, Halle, Geislingen, and Aachen. The local representative of the Gasmotoren-Fabrik Koeln-Deutz informed me that they have built, since 1867, about 60,000 gas engines with over 200,000 horsepower, and that they have also a branch house and factory in Philadelphia.

How many gas engines are in use in this consular district is impossible for me to learn, as the information was refused on account of fear of competition. There are practically no gas engines imported into Germany from any foreign country, but the export of engines is very large, especially to Russia. No factories being located here, it was also impossible for me to learn the number exported.

FUEL.

Coal is at present very high, on account of the recent strikes in the coal mines. The usual and present prices of coal are as follows per 50 kilograms (110.23 pounds):

Description.	Present price.		Usual price.	
	Marks.	*Cents.*	*Marks.*	*Cents.*
Lump coal	1.12	26.6	.90	21.4
Nut coal	1.05	25.0	.85	20.0
Dust coal	.62	15.0	.35	8.0
Coke	1.50	35.7	.85	20.0

The average price of kerosene is 11.50 marks per 50 kilograms ($2.74 per 110.23 pounds). There are no gas companies in Breslau, the city owning the 4 large gas works which supply the gas consumed here. The price of gas for illuminating and cooking purposes is 18 pfennigs (4.28 cents) per cubic meter (35.316 cubic feet); for machinery, 15 pfennigs (3.57 cents) per cubic meter.

TRANSPORTATION AND FREIGHT RATES.

There are good railroad and ship connections from the seaports to this consular district. The freight rate by rail from Hamburg to Breslau is 5.06 marks per 100 kilograms ($1.20 per 220.46 pounds) for less than a carload, and 2.85 marks (68 cents) per 100 kilograms for carloads. Ship freights from Stettin to Breslau amount to 1.20 marks (28 cents) per 100 kilograms.

C. W. ERDMAN, *Consul.*

BRESLAU, *August 21, 1900.*

BRUNSWICK.

ENGINES IN USE.

Electrical motors have generally taken the place of gas motors among the smaller manufacturers in this district. There are a number of reasons for this: The electric motor is scarcely one-third the size of the gas motor, and can therefore be more easily employed. On account of its smaller size and lighter weight, it can be placed on the ground, or against the wall, or on the ceiling, where it would be impossible to put a gas motor. It is also cheaper in price than the gas motor. As, however, electric power is considerably more expensive than gas, gas motors are employed by the larger manufacturers almost entirely, while, the question of expense not being so important, the smaller manufacturers use electricity. It follows from this that the import of gas machines from the United States would have to be confined to large motors. For this reason, I give the prices only of

the largest machines. These prices (at the factory) are taken from the catalogue of the Dresdener Gas Motor Fabrik in Dresden:

Description.	Horse-power.	Weight.	Price.
		Pounds.	
1. Vertical	6	3,960	$595
2. Horizontal	8	6,160	876
3. Horizontal	20	9,900	1,475
4. Horizontal	100	41,360	3,927

The three largest manufacturers of gas motors in Germany are the Gas Motor Factory, Dresden; Gebrüder Körting, Hanover; and Gasmotoren-Fabrik, Deutz.

IMPORTS OF GAS MOTORS.

Up to the present time, the importation of gas motors into Germany has been limited, and, as far as I can learn, only from England. There are two reasons for this: In the first place, the German factories are large and important establishments, capable of supplying the demand; and secondly, purchasers prefer home to foreign made machines. The latter reason is not to be ascribed to prejudice, but rather to the difficulty and sometimes the impossibility which purchasers find in the repair of foreign machines in Germany. If they had the guaranty that in the event of the purchase of American machines, they would be able to repair them in Germany, and that the American machine could do the same work, and the prices were no higher, few German customers would hesitate to buy an American machine.

FUEL.

The fuel used for gas engines in Germany is coal gas, spirits, petroleum, benzine, and benzol. Gas costs, per cubic meter (35.316 cubic feet), 12 pfennigs (2.76 cents); petroleum, per 100 kilograms, 23 marks ($5.47 per 220.46 pounds); benzine, per 100 kilograms, 27.50 marks ($6.54); benzol, per 100 kilograms, 21 marks ($5).

OUTLOOK FOR AMERICAN ENGINES.

The experiences of the American bicycle industry in introducing their manufactures into the German market will be duplicated in the introduction of gas motors and other machines. The main question in the successful sale of American machinery of all kinds is that of repairs. At the time of the introduction of American bicycles, this fact was distinctly emphasized. Only those American manufacturers that establish branch factories in Germany, or at least large supply houses which could easily furnish all parts of the machine at prices corresponding to the original cost of the machine, can calculate on a market in Germany. The statement, so often repeated, that all advertising descriptions and catalogues, including size, weight, and price,

should be given in the German language, also holds good with respect to gas machines.

TALBOT J. ALBERT, *Consul.*

BRUNSWICK, *December 14, 1900.*

COBURG.

ENGINES IN USE.

Gas engines are used a good deal in this consular district. About 45 are employed in Coburg, 12 in Sonneberg, and those in use in the smaller cities make the total number in the whole district about 150.

The machines mostly in use are those from the Deutz factory, near Cologne. The general agent for northern Bavaria and Thuringen informs me that in 1898, he sold in this district 142 engines, with a total horsepower of 905½, and in 1899, 165 engines, with a total horsepower of 1,040. The prices range from $190.40 for a one-half horsepower engine to $5,474 for a 160 horsepower engine, with double cylinders.

The "Deutzer Gasmotorenfabrik" (the gas-engine factory at Deutz) has lately completed the construction of a gas engine of 1,000 horsepower, which is worked by furnace gas. This is the largest gas engine ever constructed in Germany. Ten months were spent in its construction. Its weight, without the fly wheel, is 155,000 kilograms (317,130 pounds). The machine has four cylinders and works very smoothly, making 135 revolutions a minute. The same factory has turned out two engines of 600 horsepower each, which have been in use for some time and have given perfect satisfaction, so far as I can find out.

FUELS.

Kerosene is for sale at $5; naphtha (the Russian product) at $8.09, and distillated rapeseed oil at $14.28 per 100 kilograms (220.46 pounds). Gasoline is not used here.

Saxon coal is mostly used for steam boilers. The following are the prices at the mines, per 10 tons: Small coal costs $42.84; large lump steam coal, $49.98. To these prices must be added the railroad freight from Saxony, viz, $13.09 to $15.47. Coal prices in Germany at the present time are not to be relied on from one day to another.

TRANSPORTATION AND FREIGHT RATES.

The best routes for goods from New York or Philadelphia are either via Antwerp, Hamburg, Bremen, or Rotterdam. The rate is about $2 per cubic meter, plus about 25 cents per 100 kilograms (220.46 pounds) for expenses. The railroad rate from Hamburg or Bremen to Coburg is $1.19 per 100 kilograms for single engines. If several engines are forwarded together in one railroad wagon, the rate would be reduced to 69 cents per 100 kilograms.

OUTLOOK FOR AMERICAN ENGINES.

The only way to introduce American gas engines into the Coburg district is to send over reliable German-speaking salesmen, who fully understand their business. Three to six months' credit must be given, or no sales can be made. Another and a still more effective trade method would be the establishment of a large depot, under American control, in some near by city.

OLIVER J. D. HUGHES, *Consul.*

COBURG, *August 27 and December 17, 1900.*

DRESDEN.

ENGINES IN USE.

In the manufacture and practical use of gas engines, the Saxons are abreast of the times. Two of the largest plants for making gas engines in Germany are located in Dresden, and their use in this city is quite extensive.

The total number of engines in operation in Dresden on December 31, 1899, was 616, representing 4,286 horsepower, and varying in size from one-fourth to 60 horsepower, the 2, 3, and 4 horsepower being the prevailing sizes. The present number can be safely estimated at 700.

The inclosed Table I shows the exact number of gas engines in operation in Dresden on December 31, 1899, as compared with corresponding date in 1898.

Table II shows the use of gas engines in the different trades and branches of manufacture, giving number of engines and horsepower for each trade.

While the two manufacturers of gas engines in this city, viz, Dresdner Gasmotorenfabrik vormals Moritz Hille, in Dresden, and Moritz Hille, in Dresden-Löbtau, supply the greater part of the engines in operation in Dresden, quite a number are purchased from the Gasmotorenfabrik Deutz in Köln-Deutz on the Rhine, who are considered the largest gas engine manufacturers in Germany.

I can not learn that gas engines are imported into this consular district from foreign countries, but am informed that a large concern in Birmingham is making every effort to introduce its products on the Continent, and has established a general agency in Essen-Altendorf, Rhine Province.

OUTLOOK FOR AMERICAN ENGINES.

I have seen the two most prominent importers of American machinery in Dresden, and they both doubt the possibility of a profitable introduction of American gas engines into this district, unless the American

manufacturer is able to make an unusually advantageous offer in regard to quality and price of engine.

As an example, a 2-horsepower engine is sold by the Dresden factory for about 960 marks ($240) and weighs about 1,470 English pounds. If an American firm desires to compete against this price, the following costs should be considered: Imperial German duty, 8 marks per 100 kilograms, 56 marks ($13.328); freight from New York to Dresden, 6 marks per 100 kilograms, 42 marks ($9.996); packing, about 28 marks ($6.664); total, 126 marks ($29.998). This sum deducted from 960 marks leaves 834 marks, or $198. A 2-horsepower engine, therefore, would have to be delivered f. o. b. New York for $198. This estimate is very low, and the actual cost of placing American gas engines on the German market may be considerably higher.

FUEL.

Gas is the principal fuel used for propelling the motors, and is supplied by city gas works at 12 pfennigs the cubic meter. There are no separate statistics as to the amount of gas consumed by the gas engines in operation in this city, because the same kind of gas is used for cooking and heating purposes. The only separate figures I could obtain refer to 131 engines used by the city for electric lighting. These 131 engines consumed in 1899, 2,392,851 cubic meters of gas.

Other fuels, such as benzine, kerosene, and gasoline are not extensively used for power engines in Dresden, but are in the suburbs and small provincial towns, where gas is scarce or not obtainable. The present wholesale prices for these fuels are as follows per 220.46 pounds: Gasoline, 47 marks ($11.19); benzine, 37 marks ($8.806), exclusive of barrel; kerosene, including barrel, 23 marks ($5.474).

Prices for coal are at present considerably higher than ever before, principally on account of the recent strikes, and for this reason the prices of engines are enhanced by 5 per cent. The present market prices for coal are, per ton: Black coal, 25 marks ($5.95); brown coal, 12.60 marks ($3).

TRANSPORTATION AND FREIGHT RATES.

The facilities for transportation from Dresden to Hamburg and Hamburg to Dresden are good, as the River Elbe is navigable between these cities. The rates are:

By boat, per steamer at Hamburg to Dresden, fast freight, per 100 kilograms (220.46 pounds), 1.40 marks (33 cents); slow freight, 77 pfennigs (18 cents); for bulky machinery ("sperrgut") 50 per cent more, and for pieces weighing more than 1,500 kilograms (3,150 pounds), special towage and crane fees are charged. By rail, transport is more expensive—2.20 marks (52 cents) per 100 kilograms.

CHAS. L. COLE, *Consul-General.*

DRESDEN, *October 8, 1900.*

TABLE I.—*Gas engines in operation in Dresden on December 31, 1898 and 1899.*

Horsepower.	December 31—		Increase (+) or decrease (−).	Horsepower	December 31—		Increase (+) or decrease (−).
	1898.	1899.			1898.	1899.	
¼	1	1	.....	15	1	1	.....
½	15	15	.....	16	22	23	+ 1
1	69	72	+ 3	20	20	20	.....
2	124	125	+ 1	25	15	16	+ 1
3	69	68	− 1	30	9	9	.....
4	66	69	+ 3	35	.....	2	+ 2
5	17	17	.....	40	2	3	+ 1
6	58	64	+ 6	50	3	4	+ 1
8	57	62	+ 5	60	1	3	+ 2
10	10	11	+ 1				
12	24	28	+ 4	Total	585	616	+31
14	2	3	+ 1				

TABLE II.—*Use of gas engines in the different branches of manufacture.*

Industries.	Gas engines.	Total horsepower.	Industries.	Gas engines.	Total horsepower.
Preparation of mineral and electric baths	2	6	Manufacture of trunks	2	26
Working bed-feather cleaning machines	1	¼	Manufacture of powder	1	½
Manufacture of tin goods	4	20	Cutting clover, grass, etc	3	3
Manufacture of lead pipes	2	14	Operating refrigerators	13	120
Breweries	4	20	Coppersmiths' shops	1	2
Brakes (experimental)	1	8	Manufacture of lamps and lanterns	2	10
Chopping up wood	1	8	Manufacture of phototype pictures	2	18
Manufacture of brushes	1	2	Operating dynamo machines	131	2,147
Bookbinding	1	2	Manufacture of fancy goods	1	5
Printing establishments	65	323½	Manufacture of machine brushes	1	6
Color printing	1	2	Manufacture of metal goods	4	17
Manufacture of cement flooring	1	6	Manufacture of mineral waters	3	2½
Manufacture of chemicals	1	8	Preparing mortar	1	12
Manufacture of envelopes and paper bags	3	6	Dairies	1	3
Manufacture of leatherings for steam engines	1	1	Making vermicelli	1	2
Manufacture of wire	2	4	Operating fruit presses	1	2
Turners' workshops	44	160	Manufacturing an orchestrion	1	1
Manufacture of ice chests	1	2	Operating orthopedic machines	1	4
Dyeing establishments	3	8	Manufacture of laces	3	5
Operating lifts (elevators)	1	3	Operating lithographic presses	1	½
Manufacture of colors	9	23	Operating pumps	10	17½
Manufacture of photograph paper	2	4	Operating grinding machines	14	36½
Manufacture of aluminum goods	1	8	Locksmiths' and turning shops	63	218½
Mechanical bottle cleaning	4	7	Manufacture of printing type	2	3
Working meat-chopping machines	6	11	Manufacture of shoes	10	77
Carpenters' workshops	3	10	Manufacture of blacking	1	2
Manufacture of gas engines	2	31	Manufacture of soap	2	11
Manufacture of gasometers	1	1	Manufacture of mustard	5	17
Galvano-plastic purposes	1	3	Lithographing	27	150
Manufacture of false teeth	1	1	Manufacture of straw hats and sewing machines	6	22
Tanneries	4	65	Manufacture of cigars and cigarettes	27	102½
Spice mills	2	8	Manufacture of tallow	2	14
Polishing and cutting glass	4	27	Manufacture of upholstery	1	3
Manufacture of belting, leather goods, etc	5	24	Manufacture of telegraph wire	1	5
Straw-cutting machines	6	27	Carpenters' shops	24	134
Operating cranes	4	34	Manufacture of earthenware	2	5
Manufacture of wood-working machines	2	22	Manufacture of white clay	1	3
Manufacture of surgical instruments	2	4	Educational purposes	2	5
Coffee roasting	11	31	Operating ventilators	5	8
Manufacture of cardboard boxes	7	28	Nickeling	1	6
Manufacture of cases, boxes, etc	1	8	Making washing machinery	3	5
Manufacture of putty	1	1	Manufacture of machine tools	3	16
Manufacture of gluten	1	6	Scientific purposes	1	1
			Making sausages	4	1
			Making zinc ornaments	3	2
			Making confectionery	2	18
			Total	616	4,286

FRANKFORT ON THE MAIN.

Gas engines, I am informed, are used to some extent in my consular district, but I have not been able to ascertain that any are used in the city of Frankfort. I have no means at my disposal, however, to find out to what extent they are used in my district outside of the city of Frankfort. Generally speaking, gas engines are used more frequently in places without electrical power works.

DEVELOPMENT OF GAS ENGINES IN GERMANY.

A writer in the Zeitschrift des Vereins Deutscher Ingenieure traces the development of gas engines from the time when the Otto gas engine was introduced. Since then, many small engines have been constructed to burn ordinary petroleum, of which there was a good show at the Paris Exhibition ten years ago, and again at Chicago in 1893. Several leading firms in Germany next started their manufacture, but the results did not prove entirely satisfactory, the chief objections being excessive consumption of oil, imperfect combustion, dirt, smell, and irregular working. The great problem was to provide for the admixture of petroleum vapor and air in such perfect proportions and in such a manner that each explosion in the cylinder should effect the complete combustion of every particle.

In the gas engines recently built by Messrs. Dopp, the oil is superheated to a temperature considerably above condensation point and then injected in minute jets through sieve-like apertures into the combustion chamber. The vapor thus produced is drier and more uniform than that hitherto obtained. The mixture is also regulated by the driver. The combustion is so perfect that a 2-horsepower engine after working a year and a half required no cleaning.

The minister of public works had a 12-horsepower engine working for eleven months, and, according to the daily journal, the Dopp engine was shown to have consumed per horsepower per hour 0.432 pint of petroleum during the 2,808 hours it worked. There is no vibration, and the working is smooth and regular. Up to 20 horsepower, these engines are suitable for all kinds of work, where water, gas, or electric power is not available or is too costly for adoption.

The following is taken from Kuhlow's Trade Review:

GAS ENGINES FOR ELECTRIC CENTRAL STATIONS.

The great importance to central stations of a satisfactory distribution for their large heat product as well as for their small electric product is now more generally felt than formerly, and on the solution of this problem must depend the ability of central stations to displace isolated plants. Unfortunately for the cause of heat distribution, if not for that of central-station revenue, the present tendency is to remove electric generating stations so far from their service areas that the distribution of their heat from exhaust becomes entirely impracticable. This tendency is especially marked in large cities, where the demand for heat is the greatest and large isolated plants are most numerous.

If central stations are to sell the greater portion of the heat as well as the electric energy that they derive from coal, and thus reach a position where they can seriously compete with large isolated plants in the supply of light, heat, and power, it seems certain that the electric generator and its driving engine must be moved back to the vicinity of the area to be served. The many objections to a number of steam plants scattered over a thickly populated territory, as to fuel and water supply, removal of ashes, value of ground area occupied, smaller economy of power production as to coal, and the increased labor attendance, all have their weight; but the isolated plant, though hampered in all of these respects, still wins in competition with central stations that distribute as electric current only 10 per cent of the energy in coal.

Happily, however, it is not necessary to bring boilers and a complete steam equipment to the electric-generating station. The steam engine must be quite close to its boiler for economical results, but gas engines may be located some miles from plants where the gas is produced, without serious effect on the economy of power production. Electric-generating stations driven by gas engines are especially suited to crowded areas by reason of the relatively small amount of room that they require. The problem of transportation for coal and ashes is absent with them, and the only water required is that for cooling engine cylinders, this water being cooled and subject to loss only by evaporation.

Owing to the ease with which gas is transmitted through pipes, the plants for its production may be located where all of the possible economies as to transportation, water, and the labor of operation may be practiced, and such a plant may supply electric-generating stations over a very large area. The efficiency of gas engines, which ranges from 20 per cent in small engines to 25 per cent in large sizes, allows a delivery of one-third to two-thirds more electric energy for the same coal consumption than does the steam engine with its efficiency of 15 per cent. Having made this positive gain of efficiency in production of electric energy, the gas engine delivers the remaining heat from its internal combustion in a form that can be readily utilized. For gas engines of medium size, the distribution of heat may be fairly taken as, delivered work, 20 per cent; conduction and radiation, 10 per cent; jacket water, 40 per cent; and exhaust gases, 30 per cent of the total heat produced by the gas consumed.

The temperature of the jacket water may well be about 150° F., and that of the exhaust gases 700° F. These hot exhaust gases can readily be used to raise the temperature of the water from the cylinder jacket to 212° or even a higher point, and thus fit the water for heating purposes as well as can be done with exhaust steam. This hot water may be pumped through a system of hot-water mains for general heating purposes, the return flow passing again to the cylinder jackets and the coils exposed to the exhaust gases.

FUEL.

In this district as well as in the whole of Germany, all kinds of fuel are available.

Gas for power costs about 3 cents per cubic meter; gasoline, from $7 to $8 per 220 pounds; kerosene, $2.60 per 220 pounds; soft coal, from $4 to $5 per ton.

TRANSPORTATION AND FREIGHT RATES.

The facilities for transportation of machinery from the United States to this city are excellent; from New York, it can be shipped to Rotterdam, and from there by water directly to Frankfort. The

freight rates can be better ascertained from the steamship lines and their agents in New York than here. American machinery for these parts of Germany is mostly shipped by the Holland-American Line.

OUTLOOK FOR AMERICAN ENGINES.

If American manufacturers of gas engines desire to enter into competition with German firms, they ought to exhibit their machines here and show their working operation. If they can convince German purchasers that their engines are superior to the German, or cheaper, they can expect trade here.

It would be advisable for manufacturers of gas engines, contemplating trade in Germany, to send an agent over here, one who speaks the German language, to study the situation. He would soon be able to judge whether a profitable business could be established, and by such a course much money, time, and annoyance would be saved. If he comes to the conclusion that there is a chance for American engines, the expense of his trip would be a good investment, and if he arrives at a different conclusion, the expense incurred would probably be less than the loss sustained in trying to force a business which would prove a failure.

RICHARD GUENTHER,
Consul-General.

FRANKFORT ON THE MAIN,
June 30, July 12, and August 23, 1900.

A NEW GAS MOTOR.

German papers are full of praise of the Gicht gas motor. They speak of the extraordinary benefit of this motor in the German iron industry. In the foreground of smelting interests, they claim, stands the utilization of gases of smelters for motor purposes, recently accomplished so successfully. As long as only ordinary lighting gas could be used for gas motors (which is seven times as high per caloric unit as coal) the gas motor could not compete with steam power. With the employment of cheaper gases, gas motors have shown a rapid rise.

At works with a daily capacity of 600 tons of iron, enough gas is available to supply from 12,000 to 15,000 horsepower.

Kirchhof's Technical News states that, according to expert testimony, the use of smelter gases for motor power will result in a saving of $5,000,000 per annum for the German pig-iron industry.

The Gicht gas motor, it is said, runs smoothly and quietly, and the purification of the gases is effected in a manner requiring only a small plant. The efficiency of the gases in the motor is stated to be twice as great as under boilers, and the cumbersome boiler batteries, which are liable to explode, are dispensed with.

Ten years ago it was almost impossible to construct gas motors of 100 horsepower; to-day, those of from 1,000 to 1,200 horsepower are not unusual.

The reason for this is that the utilization of heat in the gas motor, especially when cheap power gases are used, is much greater than in the steam engine.

The complete utilization of the gas marks a very important advance in the economical generation of power.

RICHARD GUENTHER,
Consul-General.

FRANKFORT, *March 25, 1901.*

HAMBURG.

ENGINES IN USE.

According to the census of 1895, there were 388 gas engines, with a total of 1,428 horsepower, in use in the State of Hamburg, whereas the last statistics, compiled in December, 1900, show that there are at present 399 such engines, with a total of 2,705½ horsepower, in use, an increase during the last five years of 11 in number and of 1,277½ horsepower, many small and old engines having evidently been replaced by more powerful new ones, the average horsepower being at present about 7. From catalogues describing such engines as are mostly used in this consular district, it is ascertained that the average price for gas engines of 7 horsepower is about $700.

Although the official statistics do not give the source of supply of the engines in use at Hamburg, they are, no doubt, almost exclusively of German manufacture. The engines most in use in Hamburg are the "Otto," manufactured by the Gasmotoren-Fabrik Deutz, at Köln-Deutz. The Otto engine is also manufactured in the United States by an American firm at Philadelphia.

FUEL.

Fuels available are gas, petroleum, and coal. The price for gas used for other than lighting purposes, which is furnished exclusively by the municipal gas works, is 12 pfennigs per cubic meter (2.856 cents per 35.316 cubic feet). The present price for petroleum, such as "Pennsylvania standard white," in barrels, is about 9.20 marks per 50 kilograms ($2.19 per 110 pounds), duty paid. The price for coal suitable for steam boilers is about 225 marks per 10,000 kilograms ($53.55 per 22,046 pounds).

TRANSPORTATION AND FREIGHT RATES.

As to the facilities for transportation of machinery from the United States to this consular district, there are sufficient steamships plying

regularly between all the larger ports of the United States and Hamburg. The Hamburg-American Line has a freight service between Hamburg and Portland, Me., Boston, New York, Baltimore, Philadelphia, and New Orleans. The steamers of the Union Line, owned by a Hamburg firm, which generally run fortnightly, touch New York and Newport News. The Vogemann Line steamships, fortnightly sailings, ply between New York and Hamburg. The freight rates for most of these steamship lines are generally governed by special agreements between the respective companies, in order to avoid unfavorable competition, but they are, notwithstanding, subject to fluctuations. It is therefore impossible to state the exact rates at present prevailing for freight from the United States to Hamburg, but these can easily be ascertained by applying to any forwarding agent in the United States, stating at the same time the tonnage or measurement of the respective shipment. German railways are, with but few exceptions, in the hands of the Government, and the freight rates are fixed by tariff.

OUTLOOK FOR AMERICAN ENGINES.

Complaints have repeatedly been made by German importers of American machinery that in spite of strict instructions, the manufacturers in the United States failed to ship such machinery packed in crates, but used heavy cases, thus unnecessarily increasing the duty, the same being charged on the gross weight of the packages.

There is no reason why American gas engines should not be introduced into Germany, unless ocean freight and duty are obstacles. It would be an absolute necessity, however, for American manufacturers desirous of introducing their engines on the German market to be represented in this country by agents who are thoroughly acquainted with all particulars connected with their line of business. To largely advertise the manufactures would also be necessary, as the Germans, in general, are conservative in every respect and inclined to support home industry, unless the foreigner is able to give more favorable terms.

An obstacle, perhaps, to the introduction of American gas engines is the fact that American shippers require cash payment against delivery of shipping documents, while the German buyers are accustomed to pay at three, and sometimes even at six, months' sight.

HUGH PITCAIRN, *Consul.*

HAMBURG, *February 7, 1901.*

LEIPZIG.

ENGINES IN USE.

The gas engines which are used in this district are chiefly to be found in small factories, where the amount of power required is limited. Gas

engines are manufactured extensively in this city and neighborhood, and can be purchased at from $275 to $2,500 f. o. b. at factory, exclusive of cooling tank, cast-iron foundation, packing, gas-pressure regulators, and a second fly wheel. For engines of over 10 horsepower, the base screws are also extra. The price of such engines depends largely upon the horsepower; $275 will buy a 1-horsepower engine, and $2,500 a 60-horsepower. Petroleum, benzine, and acetylene gas motors are also manufactured in this section, and are offered for sale at from $300 to $3,250, the price depending upon the horsepower.

The gas engines used in Leipzig and vicinity are mostly of domestic manufacture, and the competition is very keen.

FUEL.

The fuel used is gas, benzine, kerosene, and acetylene gas. Soft coal is employed for steaming purposes, and costs from $1.79 to $2.26 per ton in Leipzig.

TRANSPORTATION AND FREIGHT RATES.

The machinery and all other heavy freight which is imported into this district is shipped almost exclusively via Hamburg up the Elbe to Wallwitzhaven by steamer, and then to its destination by rail.

OUTLOOK FOR AMERICAN ENGINES.

A member of a firm dealing in English and American machinery expressed himself as follows: "I have handled gas and petroleum engines, but I must say that there is little money in them, at least in this part of the country. There are dozens of firms manufacturing them here, and I do not think the American engine manufacturers can compete in this market." On being asked if he would accept the agency for a good American gas engine, he replied: "Not unless it was something new and much superior to those made here, which are up to date in every particular. I should say that there might be a market for American motors in Russia. The German manufacturers are exporting a very large number to the markets of that country."

BRAINARD H. WARNER, JR.,
Consul.

LEIPZIG, *September 17, 1900.*

MAGDEBURG.

ENGINES IN USE.

Gas motors are in general use in this district, and their introduction for all sorts of employment is rapidly increasing. The consumption of gas in Magdeburg, for instance, is assiduously urged and supported in every respect by the municipality, which, by the way, is also the

owner of the gas establishments. It offers to make connections with the plant without charge, for heating and motor power purposes, and for this reason, gas engines are frequently employed in coffee roasting and smaller establishments, such as printing shops, etc.

Gas engines seem to be continually increasing in number, according to the annual report of the Allgemeine Gas-Actien Gesellschaft at Magdeburg, which owns gas plants in several towns of Germany. They used 489,631 cubic meters gas for motor power in 1899, which is 8.6 per cent of the total consumption, against 31,078 cubic meters in 1898, The company reports that the increase in the number of the gas engines amounted to 6.3 per cent during 1899. A further proof may be the fact that by the increased use of patent gas-saving burners for street lighting, and electric light in railway stations and factories, a deficiency in consumption of 120,750 cubic meters resulted, which was, however, overcome considerably by the surplus consumption of 116,673 cubic meters for heating and 173,528 cubic meters for power purposes. It is therefore quite natural and to their own interest when such companies as well as municipalities pay special attention to the surplus consumption of gas for power purposes, which in turn will materially benefit the interested motor industry. On the other hand, however, the employment of electromotors also shows a constant increase. In the city of Magdeburg, the respective numbers were 114, 173, and 233 on December 31, 1897, 1898, and 1899, for 499, 749, and 1,096 horsepower, respectively.

The street railway of the capital of the duchy of Anhalt-Dessau (about 43,000 inhabitants), deserves to be mentioned here. This road was built some years ago by the Dessauer Gas-Actien Gesellschaft for the use of gas motors, which were, however, found impractical and unprofitable; and it will be changed into an electric road during the coming year.

"GASOLINE-HYDRIRIN" ENGINES.

In regard to the price and the kind of gas engines, the Gasmaschinenfabrik Amberg (Bavaria) may be considered authoritative. They are making a specialty of gas-producing motors, and for heating purposes use a petroleum distillate which, under the name of "gasoline hydririn," can be procured here easily. It possesses a specific weight of 0.640 to 0.650. The American refineries are general producers of this product, and the American raw petroleum is particularly well fitted for the production of this volatile hydrocarbon. The German consumers especially are obliged to use American petroleum, and for this reason alone the introduction and manufacture of such engines in the United States might be recommended. The price of the above-mentioned gasoline in Germany is at present 22 to 25 pfennig (5 to 6 cents) per pound; that of petroleum, 7 pfennig (1.77 cents) per pound, and of coal gas for power purposes at Magdeburg, 0.10 mark (2.38

cents) per cubic meter (35.316 cubic feet). The costs of lighting for an auer-light flame of 50 to 60 candles at a fundamental price of gasoline of 22 pfennig (5 cents) per pound amounts to 2½ pfennig (½ cent); the price of the gas is 15 pfennig (3½ cents) per cubic meter (35.316 cubic feet). Government and military authorities of domestic and foreign countries are giving these engines increased attention, and introduce them in many instances. Recently, a plant of about 40 flames was erected for trial by this Amburg firm in the imperial tent of the military camp at Loburg-Altengrabow near Magdeburg. The Kaiser has expressed his satisfaction with this arrangement and the Prussian minister of war has recommended its purchase. These engines are manufactured in seven different sizes at the following prices:

Description.	Marks.	Dollars.
No. 1. Mechanical work till 15 flames	500	119.00
No. 2. Mechanical work till 25 flames	680	161.80
No. 3. Mechanical work till 40 flames	800	190.40
No. 4. Mechanical work till 70 flames	1,000	238.00
No. 5. Mechanical work till 120 flames	1,350	321.30
No. 6. Mechanical work till 150 flames	1,820	433.20
No. 7. Mechanical work till 200 flames	2,000	476.00

The well-known firm of Moritz Hille, Dresden, furnishes the following engines:

Horsepower.	Engines.				
	Petroleum.	Gas.	Benzine.	Acetyline.	Generator-gas.
1	$285	$261	$333	$309	.....
2	357	333	393	387	.....
3	452	428	476	452	.....
4	547	523	571	547	.....
5	618	595	690	643	.....
6	714	690	785	738	.....
8	833	809	904	857	.....
10	1,000	952	1,000	1,000	.....
12	1,142	1,095	1,190	1,190	.....
15	.....	.....	.....	1,428	.....
16	1,380	1,238	1,476	.....	$1,428
20	1,571	1,428	1,714	1,547	1,607
25	1,809	1,607	1,833	.....	1,726
30	2,047	1,726	1,952	.....	1,904
35	2,380	1,904	2,188	.....	2,142
40	2,618	2,142	2,380	.....	2,261
50	2,856	2,261	2,547	.....	.....

The same company also furnishes petroleum and benzine traction-engines of all sizes to the price of:

Horsepower.	Petroleum.	Benzine.	Horsepower.	Petroleum.	Benzine.
2	$595	$666	8	$1,190	$1,309
3	690	761	10	1,332	1,476
4	809	904	12	1,523	1,689
5	928	1,023	16	1,714	1,904
6	1,047	1,166			

The famous German gas-engine factory "Deutz," at Köln-Deutz, furnishes gas engines from ½ to 600 horsepower for traction engines, locomotives, and vessels.

OUTLOOK FOR AMERICAN ENGINES.

The extent of the German motor industry will be illustrated by the last statistics—of the year 1895. At that time, Germany had 30 plants and an average of 3,260 persons devoted to the construction of petroleum, benzine, and gas engines, and from 1877 to 1898, 1,356 patents for air and gas engines were granted. However, I believe the time has come where American manufacturers of such machines can enter and find a ready market in this country. The total import of American machinery is rapidly increasing, especially since prices of raw products used in and for their construction, such as iron and coal, notably the latter, are continually rising. It is but natural that prices of machines manufactured under these conditions should also advance, and as proof thereof, a notice of the firm of Moritz Hille, which is attached to the cover of their latest price list, announces that owing to the continual increase of prices in raw materials, the figures given in the catalogue must be increased 5 per cent from November 1, 1899.

The scarcity of coal is, for instance, so great at present that some factories are obliged to reduce their output. According to the last reports in Magdeburg, the brown coal, which is especially produced and used in this vicinity for steam heating purposes, only costs 40 marks ($9.52) per 10 tons and common coal (Steinkohle) costs 275 marks ($65.45) for the same quantity.

Quality and prices from a commercial point of view are the two essential points to be taken into consideration by American manufacturers who intend to bring their wares to this country. Judging from the unfavorable conditions mentioned herein, under which the German manufacturer of machinery is working at present, the end of which is apparently not in sight, I believe, as I have said before, that our time has come to enter into successful competition for this market, for the superiority of American machinery is conceded by all, and we can now, beyond doubt, undersell them also.

TRANSPORTATION AND FREIGHT RATES.

In regard to transportation of American imports, there are two different routes to be considered, as far as Magdeburg is concerned.

The railroad freight rates from the nearest seaports to Magdeburg for machinery, iron, and raw wood manufactures are as follows per 220.46 pounds:

	Cents.
Bremen:	
Piece goods	99
Loads of 5 tons	35
Loads of 10 tons	31
Hamburg:	
Piece goods	96
Loads of 5 tons	33
Loads of 10 tons	30

GERMAN RAILWAY DISCRIMINATION.

In this connection, it is well to mention the protection granted domestic industry by German railways in case of exports, in allowing reduced rates, a feature which no doubt deserves imitation by our American railroad companies. Thus, for instance, the rates to the above-mentioned seaports, in case of export by sea, for machinery and ironware from Magdeburg are, per 100 kilograms (220.46 pounds):

	Cents.
Bremen:	
Piece goods	48
Loads, not less than 10 tons	20
Hamburg:	
Piece goods	45
Loads, not less than 10 tons	19

A comparison with the rates first given shows the advantage of the German exporter.

The freight rates by water, although much lower, can not be arrived at, since the waterway is impassable for four or five months during winter, which fact must be taken into consideration in estimating the expense.

As an advantage for importers might be mentioned the fact that certain forwarding offices at Hamburg and Bremen send to most of the larger places in Germany collected carloads, i. e., they gather piece goods intended for certain places and adjacent to a centrally located distributing point, whereby they gain cheaper rates, as the expense for distributing is very small compared to the increased rates of piece goods. The only disadvantage in this method lies in the delay of collecting carloads.

MAX J. BAEHR, *Consul.*

MAGDEBURG, *September 11, 1900.*

MAINZ.

ENGINES IN USE.

Gas engines are used to some extent in this consular district, but in towns in which electric-power plants have been erected, electric motors seem to be preferred. Such is the case in this city, in which an electric plant was put in operation not quite a year ago, and now frequently advertisements appear in the local newspapers offering second-hand gas engines for sale, on account of substitution of electric power.

The prices for gas engines range from 800 marks ($190.40) for one-half horsepower engines up to 70,000 marks ($16,660) for 600 horsepower engines.

The Gas Motoren Fabrik Deutz Company, which has a branch

house at Darmstadt for this district, has branch houses in many countries. The engines of this company are also built in the United States by the Otto Gas Engine Works, of Thirty-third and Walnut streets, Philadelphia, Pa.

OUTLOOK FOR AMERICAN ENGINES.

Whether gas engines could be profitably introduced into this district is a question to which there are pros and cons. The fact that electric motors are superseding them to a large extent where electric power is available seems to speak against gas engines, while the fact that the Gas Motoren Fabrik Deutz has a branch house in this district seems to show that there is some demand for these engines.

I am informed that gas engines are used to some extent at blast furnaces, utilizing their waste gases.

FUEL.

The same fuels are available here as in the United States, though, on the whole, the prices may be slightly higher. Only bituminous coal is used for steam boilers, as, in the first place, anthracite coal is too expensive, and secondly, the grates are constructed to burn only soft coal.

TRANSPORTATION AND FREIGHT RATES.

The facilities for transportation to this district are exceptionally good. The cheapest route is the following: By steamer or sailing vessel to Rotterdam, and thence by barge up the Rhine to Mainz. Freight rates from Rotterdam to Mainz vary greatly according to the season of the year. They are lowest in spring and early summer, when the water of the Rhine is high, and highest in fall and winter, when the Rhine is lowest.

WALTER SCHUMANN, *Consul.*

MAINZ, *August 29, 1900.*

MANNHEIM.

ENGINES IN USE.

Gas engines are manufactured and used here to a very considerable extent. Upward of 300 are in use in Mannheim alone. Most of these were built by the firm of Benz & Co., of this city, who are the only manufacturers of such engines in this consular district. This company employs about 800 workmen in the manufacture of automobiles and gas engines. They are well-known pioneers in the use of hydrocarbon motors for automobiles. It is said that upward of 5,000 of their gas engines are now in use. They claim superiority for their engines in simplicity and durability of construction, economy in the use of

fuel, and in the absence of any considerable noise in their operation. The engines present a compact and well-finished appearance, and range from 1 to 100 horsepower. The Benz engines are fitted for the use of benzine, or "ligroin," as it is frequently called, or ordinary illuminating gas. Benzine costs about 16 cents per gallon in Mannheim. The supply comes from the United States. It is admitted free of duty when used for motive power. The Benz Company say their engines require from 0.30 to 0.45 kilograms (0.44 to 0.67 quarts) per hour for each horsepower. Ordinary illuminating gas is furnished in Mannheim for motive power at a trifle less than 3 cents per cubic meter, or about 85 cents per 1,000 feet. The amount of this gas required for the Benz engines is stated to be three-fifths of a cubic meter (21 cubic feet) per hour for each horsepower. The proprietors of a department store in this city have just installed a lighting plant in their building employing two 25-horsepower Benz engines using ordinary illuminating gas. They verify the figures given as to the amount of gas required.

As gas engines in use here are of various types and sizes, it is difficult to give accurate figures as to prices. The Benz Company say their prices are about one-third higher than the prices of American engines of the same type, but that the difference in price is offset by the superiority of their engines. This claim is frequently made by the German manufacturer and is, of course, to be taken for what it is worth. The prices quoted by this company for engines of 4 horsepower range from 1,600 marks ($380) to 2,450 marks ($583); for engines of 10 horsepower, from 3,300 marks ($758) to 4,400 marks ($1,047); for engines of 25 horsepower, from 6,000 marks ($1,428) to 7,000 marks ($1,666). These prices are free on board cars at the factory.

OUTLOOK FOR AMERICAN ENGINES.

It is doubtful whether American gas engines would find a ready sale in this market, unless the manufacturer can show a decided advantage over the native machine in price and other features. There is no marked prejudice against American machinery in this locality, but where the native machine is fairly satisfactory and has a secure footing, the introduction of machinery of foreign makes is difficult. If done at all, it is at present generally through large houses at Berlin or Hamburg, which frequently keep in the background the fact that the machine is imported. I have had pointed out to me several machines in a large machine shop here which were in fact made in Ohio but which bore only the German label of the importer at Berlin.

There is no question that with the price of coal in Germany at from $5 to $6 per ton, as at present, the gasoline or benzine engine will continue to increase in popularity.

Mannheim presents superior advantages as a center of distribution for American machinery; it is at the head of Rhine navigation and has an immense river commerce. Too much stress, however, can not be placed upon the importance of introducing only good and durable machinery in this market. The German has but little patience with a tool or machine, and especially an imported one, which soon breaks or gets out of order. It may be heavy and even clumsy, but if it wears well and does the work, he is content. This disposition of the German is exemplified everywhere, in the hand rake, plow, or cart he uses, as well as in the building of bridges and public roads. Our manufacturers will do well to keep this constantly in mind when considering the German market.

The Standard Oil Company and the Pure Oil Company, of Pennsylvania, have large plants here. Oil is brought by barge direct from the ocean steamers at Rotterdam and is widely distributed from here.

H. W. HARRIS, *Consul.*

MANNHEIM, *October 11, 1900.*

MUNICH.

ENGINES IN USE.

Gas engines are in very general use in this consular district. Most of them are of German make.

The principal places of manufacture are Munich, Augsburg, Nuremberg, Ansbach, Cannstatt, Mannheim, Berlin, Hannover, Niederbronn, Rüsselsheim, Aix la Chapelle, Bielefeld, and Cologne.

Most of the engines are driven by benzine or petroleum, but in the cities, gas is the principal motor power.

FUEL.

Owing to a large and comprehensive coal trust and an active demand, the price of coal has advanced rapidly within the past year and prices are fluctuating. The quotation to-day is $6.50 per ton for soft coal; wood is worth $6.60 per cord; petroleum, $0.21 per gallon; benzine, $5.53 per cwt.

TRANSPORTATION AND FREIGHT.

The best means for transportation would be by water via Bremen, Hamburg, or Rotterdam to Mannheim, thence by rail to Munich. Freight rates would vary greatly with the route taken, the lowest would probably be by Rotterdam.

JAMES D. WORMAN, *Consul.*

MUNICH, *October 6, 1900.*

REPLIES TO CONSUL WORMAN'S INQUIRIES.

Under date of August 23, Consul Worman addressed the following communication to leading houses in his district:

GENTLEMEN: I beg leave to ask for information on the following questions:

1. Are gas engines in general use in Bavaria?
2. Are they manufactured here or imported?
3. What fuels are mostly used, gas, petroleum, benzine, etc.?

I would thank you for any price lists or catalogues that might be agreeable to send to this consulate.

Mr. C. Moll to Consul Worman.

In answer to your esteemed favor of the 23d, permit us to say that in communities where gas works exist, a great many gas engines are in use. Most of the larger engines are made, as far as we know, by the Gasmotorenfabrik Duetz and by Gebrueder Koerting, in Hannover. Besides these two large factories, there are at least 50 or 60 smaller ones likewise manufacturing engines of the better class.

In minor industrial and agricultural enterprises benzine, and petroleum engines are also used. They are made almost entirely in Germany.

For automobiles and boats, benzine motors are almost exclusively used. However, the use of these is very limited. The Daimler Motorengesellschaft in Cannstatt, Benz & Co. in Mannheim, Eisenacher Motorfahrzeugfabrik, Motoren and Motorfahrzeugfabrik, Berlin, Dietrich in Niederbronn, Opel in Ruesselsheim, Cudell & Co. in Aix-la-Chapelle, Bielefelder Machinenfabrik Duekop in Bielefeld, Kuehlstein in Berlin, together with smaller concerns, represent this industry in Germany. A few firms manufacture electric vehicles.

We are sorry to say that we can not furnish you with catalogues, price lists, and literature on this subject.

We remain, etc.,

"MOTOR" GESELLSCHAFT M. B. H.
C. MOLL.

Messrs. Linser and Vollnhals to Consul Worman.

MUNICH, *August 24, 1900.*

1. Gas engines are in general use in Bavaria. In recent times, the electric motor has provoked a sharp competition.

2. The motors are mostly manufactured in Germany.

3. Benzine engines are now in most general use, because they can be set up in any part of the country. Because of the growing interest in electricity, gas is little used. There are few petroleum engines in use now, because benzine engines are much more perfect. Inclosed price list.

MUENCHNER MOTORENFABRIK, MUENCHEN-SENDLING.
LINSER & VOLLNHALS.

Mr. Gebr. Beissbarth to Consul Worman.

MUNICH, *August 24, 1900.*

In answer to your valued letter of the 23d, permit us to say:

1. In factories, gas engines are mostly used; in agricultural business, the benzine engine is gradually making its way to the fore.

2. The Otto'schen engine, made in Germany, near Cologne, is best known.

3. In cities, gas is mostly used, although benzine and petroleum are coming into general favor.

Always at your service, and with kindly greetings,

Most respectfully, yours,

GEBR. BEISSBARTH.

Messrs. Schur & Co. to Consul Worman.

MUNICH, *August 30, 1900.*

In answer to yours of the 28th instant: gas engines are in general use in Bavaria. They are manufactured by the Machinengesellschaft, Munich; Muenchner Motorenfabrik, Munich; Verienigte Fabriken Machinenfabrik, Augsburg, and Machinenbau-Gesellschaft, Nuremberg; Bachmann, in Ansbach; also in the other parts of Germany.

Gas, benzine, and petroleum are preferably used for fuel.

Respectfully,

SCHUR & CO.

The following firms, all in Munich, also replied to the consul's inquiries, but the information given in their courteous communications is covered by the foregoing: Machinbau-Gesellschaft (Gez. F. Pübel), L. O. Stoeckel, Chr. N. Schad.

POMERANIA.

ENGINES IN USE.

In this consular district (Pomerania), there are not as many gas engines in use as in the southern provinces of Germany.

Stettin has a population of about 160,000. Its principal industries are shipbuilding and the manufacture of cement, while the province at large is agricultural. The local gas works, which is municipal, supplies 78 gas engines from one-half to 25 horsepower, all of German manufacture, with fuel at a cost of 10 pfennigs (2.38 cents) per cubic meter (35.316 cubic feet); gas used as fuel for electrical machinery, at 13 pfennigs (3.09 cents) per cubic meter, and when used for light, 15 pfennigs (3.57 cents) per cubic meter. In addition to the 78 engines mentioned, there are some, how many I am unable to say, which generate their own gas with a gas generator manufactured by Deutzer Gas Motorenfabrik.

The Otto gas engine (originally patented in Germany), which, I believe, is also manufactured in the United States, is in most common use. The following prices (unable to get discount) are based on f. o. b. at factory on gas engines by the Berlin-Anhaltische Maschinenbau-A.-G., Dessau, Germany:

Horsepower.	Price.	United States money.	Horsepower.	Price.	United States money.
	Marks.			*Marks.*	
½	1,100	$261.80	8	3,600	857.30
1	1,300	309.40	10	4,500	1,071.50
2	1,650	392.70	16	6,000	1,428.50
3	2,000	476.00	20	6,750	1,606.04
4	2,400	571.20	25	7,500	1,784.90
5	2,850	678.30	30	8,500	2,022.90
6	3,250	774.00	50	11,000	2,081.40

The Gas Motorenfabrik Deutz, Deutz, quotes prices as follows:

Horse-power.	Maximum production per hour.	Cost f. o. b. at factory.	Equivalent in United States money.	Horse-power.	Maximum production per hour.	Cost f. o. b. at factory.	Equivalent in United States money.
	Cu. meters.	*Marks.*			*Cu. meters.*	*Marks.*	
6	23	3,000	$714.00	20	70	3,800	$904.40
8	28	3,150	749.70	25	85	4,200	999.60
10	34	3,300	785.40	30	100	4,500	1,071.00
12	44	3,450	821.10	35	120	4,800	1,142.40
16	57	3,600	856.80	50	170	5,300	1,261.40

FUEL.

Coke and anthracite are used only in generating gas, the consumption of fuel being put at 2.20 pounds per horsepower per hour on all engines over 8 horsepower. Coal, coke, anthracite, gasoline, petroleum, and naphtha oil are available as fuel. The present price of coal is very high—soft coal, 1.6 marks (38 cents) per 110 pounds; hard coal, 3.2 marks (77.16 cents) per 110 pounds; naphtha oil, coming mostly from Russia, in iron casks containing 4 to 5 centuers, sells at present at 35 marks ($8.33) per 100 kilograms (220.46 pounds). One year ago, the same oil sold at 18 marks ($4.52).

It is quite evident that this oil is to play a prominent part as fuel for Russian steamers. Three tank steamers, built about two years ago at this port for a Russian concern, were fitted out with naphtha tanks; and I learn that many of the steamers plying the Black and Caspian seas are now using naphtha of a very raw state for fuel.

TRANSPORTATION AND FREIGHT RATES.

The Skandinavian and the Skandia lines have four steamers per month direct to Stettin from New York. Freight rates east are very high and can only be given by the New York offices.

JOHN E. KEHL, *Consul.*

STETTIN, *September 25, 1900.*

ITALY.

CASTELLAMARE.

ENGINES IN USE.[1]

Gas engines are not in use in this district. There is certainly a field here to exploit them, but it should be borne in mind that all catalogues and correspondence must be carried on in the Italian language. Notwithstanding the fact that I have over and over again tried to impress this important point upon Americans desiring to enter this market, little or no attention is given to the admonition.

FUEL.

The cost of kerosene is 74 lire ($14.28) per hectoliter (26.417 gallons). Coal suitable for steam boilers is 46 lire ($8.87) per ton.

TRANSPORTATION.

Ample facilities for transportation exist, viz, steam service between New York and Naples, and railroad service throughout most of this consular district.

JOSEPH E. HAYDEN, *Consul.*

CASTELLAMARE, *August 20, 1900.*

CATANIA.

ENGINES IN USE.

Gas engines were introduced into Sicily about six years ago, and have been in use in this district for three years. The number now running in this city and province is about thirty.

The quoted prices are as follows:

Horsepower.	Price.		Horsepower.	Price.	
Horizontal (one cylinder):	*Lire.*		Horizontal (two cylinders):	*Lire.*	
½	1,300	$234.00	80	23,000	$4,140.00
1	1,500	270.00	100	28,000	5,040.00
2	1,800	324.00	120	32,000	5,760.00
3	2,200	396.00	150	36,000	6,480.00
4	2,700	486.00	Vertical:		
5	3,000	540.00	½	1,200	216.00
6	3,300	594.00	1	1,500	270.00
8	3,700	666.00	2	1,800	324.00
10	4,700	846.00	3	2,200	396.00
12	5,200	936.00	4	2,600	468.00
14	6,000	1,080.00	5	3,100	558.00
16	6,500	1,170.00	6	3,600	648.00
20	7,500	1,350.00	Vertical (heavy):		
25	8,000	1,440.00	1	1,500	270.00
30	8,500	1,530.00	2	1,900	342.00
40	13,000	2,340.00	3	2,300	414.00
50	15,500	2,790.00	4	2,600	468.00
60	17,000	3,060.00	6	3,600	648.00
70	18,500	3,330.00	8	4,000	720.00
80	20,000	3,600.00	10	4,400	792.00
			12	4,800	864.00
			16	5,400	972.00

[1] Consul Jarvis, of Milan, says "The duty on gas engines is 120 lire ($23.16) per ton (2,204.6 pounds).

Gas-generating plants are quoted as follows:

Horsepower.	Price.		Horsepower.	Price.	
	Lire.			*Lire.*	
8	5,200	$936.00	30	7,600	$1,368.00
10	5,500	990.00	35	8,300	1,494.00
12	5,800	1,044.00	40	8,800	1,584.00
16	6,000	1,080.00	50	9,500	1,710.00
20	6,400	1,152.00	60	10,300	1,854.00
25	7,000	1,260.00	80	11,500	2,070.00

From the best information at hand, the maximum discount from these prices is 30 per cent, the time of payment being as long as three years.

The chief sources of supply are as follows: Messrs. Langen & Wolf, Milan (Otto engines); Mr. L. Martel, Rome (simplex engines); Messrs. Crossley Brothers, Manchester, England (Otto engines). The largest sale is made by Langen & Wolf, who have established an agency in Catania. The engines are shipped by rail to Genoa, Leghorn, or Naples, thence by steamer to Sicily.

OUTLOOK FOR AMERICAN ENGINES.

The best means of introducing American engines would be to establish an agency, as Messrs. Langen & Wolf have done. Messrs. Franck & Donatelli, of Catania, would represent an American firm for the sale of gas engines.

Large sales can not be expected, as the market for engines here is very limited.

FUEL.

Coal and kerosene are the only available fuels, both being very high in price; coal $8 per ton, and kerosene 40 cents per gallon.

TRANSPORTATION AND FREIGHT RATES.

There are no direct steamship lines from the United States to Sicily. The best points for transshipment are Genoa and Naples.

Freight may be calculated at 30s. ($7.30) per ton.

ALEXANDER HEINGARTNER, *Consul.*

CATANIA, *October 5, 1900.*

MESSINA.

ENGINES IN USE.

There are now in operation in this district about 50 gas engines, with a total horsepower of 200. Some are of Italian make, but the majority are Belgian and German, the average cost being $375 for an engine of 2 horsepower set up ready for work.

FUEL.

The fuels available are gas and coal, the former costing about $3 per 1,000 feet, and the latter, at the present moment, about $10 per ton, the normal price being about $5.50.

Gasoline is not available, and the price of petroleum, 65 cents a gallon, puts its use out of the question.

TRANSPORTATION AND FREIGHT.

Machinery can be shipped from New York direct to Messina by the Mediterranean Line, Anchor Line, and Navigazione Generale. The rates of freight are so fluctuating that reliable information can be obtained only from the companies.

OUTLOOK FOR AMERICAN ENGINES.

Bearing in mind the primary motive of this inquiry, which is, of course, the sale of American engines in this country, let me suggest to those who desire to enter upon this trade that they will save both time and money if they will bear in mind that it is absolutely useless to expect to compete with other countries by sending here catalogues printed in English and with measurements and prices in our terms. Every gas engine in use in Messina to-day has been sold by the agent of the manufacturers who personally laid before the would-be customers the plans and explained their workings clearly in the language of the country.

CHAS. M. CAUGHY, *Consul.*

MESSINA, *October 24, 1900.*

MILAN.

ENGINES IN USE.

There are 536 gas engines in service in the Milan district. The prices are as follows:

Horsepower.	Price.		Horsepower.	Price.	
	Lire.			*Lire.*	
1	1,400	$270.20	8	3,400	$656.20
2	1,800	347.40	10	4,000	772.00
3	2,000	386.00	12	4,400	869.20
4	2,400	163.20	16	6,500	1,254.50
5	2,800	540.40	20	7,000	1,361.00
6	3,000	579.00			

The makers are Crossley Brothers, Langen & Wolff, and Fratelli, Pratee & Co. The Crossley Brothers' engines are imported from England; the others are made in Milan.

OUTLOOK FOR AMERICAN ENGINES.

The best means by which gas engines can be introduced from the United States is to have a reliable traveler or representative in the country who could visit all works where power is required. He should be prepared to quote the lowest possible price for the best possible engine.

FUEL.

Steam coal costs in Milan 38 francs ($7.33) per ton. The price of gas is 18 centesimi per cubic meter, with 4 centesimi added for the Government and city taxes, making a total cost to the consumer of 22 centesimi (4.246 cents) per cubic meter (35.316 cubic feet).

Oil is extremely dear, owing to the Government tax, which for oils of 840 specific gravity is 80 lire ($15.44) per ton and for oils below 840 specific gravity, 480 lire ($92.64) per ton.

TRANSPORTATION AND FREIGHT RATES.

Genoa is the nearest port of arrival to Milan. There are many classes for freight on the Italian railroads. There is no special class for gas engines, and such would probably come under the head of "Machines or mechanisms or parts of mechanisms not named in above lists, of a weight up to 5 tons, each case or package without guaranty against damage for such as are not packed or protected." The freight, slow, on this class is about 20.20 lire ($4.03) per ton from Genoa to Milan, a distance of 94 miles.

WM. JARVIS, *Consul.*

MILAN, *November 26, 1900.*

GREECE.[1]

ENGINES IN USE.

Gas engines are used in this consular district to a limited extent, owing to the high price of gas. There are no gas engines manufactured in Greece, and those imported up to this date have been nearly all brought from England. I have been informed that one gas engine was imported from the United States, but, with the large freight charges, cost more delivered here than those from England, and as a result, no more American engines of that class have been imported.

[1] *Gas motors and gas stoves in Greece.*—Consul-General Guenther, of Frankfort-on-the-Main, reports that the German Museum of Commerce calls attention to the fact that Greece at present offers good chances for the sale of gas motors of all kinds. The gas works of Athens and Piræus furnish gas for commercial purposes at very low prices. The Greek mines install gas motors in ever-increasing numbers. Gas stoves also find a ready market at good prices. Gas motors are on the free list in Greece. It is said to be advisable that the catalogues and price lists should be in French.

The prevailing prices of gas engines, delivered at Piræus, are as follows:

One and one-half horsepower, $150 to $170; 2½ horsepower, $250 to $270; 4 horsepower, $320 to $340; 6 horsepower, $390 to $400.

FUEL.

All fuels used to generate power in Greece are imported. Benzine is generally used to operate gas engines. The average prices of fuels at Piræus are as follows: Benzine, 37 francs, gold ($7.14), per 100 kilograms (220.64 pounds). Per oke (2.84 pounds): Gasoline, 40 cents; kerosene, 43 cents; crude oil, 27 cents; charcoal, 2 cents; coke, 1 cent; wood, one-half cent. Hard coal, 32s. ($7.78), gold, per ton.

TRANSPORTATION.

There is no direct line of steamships between Grecian and United States ports, hence there are no facilities for shipping American engines to Greece except through other European countries. This consulate has, at different times during the last two years, endeavored to induce some company to put on a line of steamers between Grecian and American ports, but thus far without success, although some very good inducements have been held out to them.

DANIEL E. MCGINLEY, *Consul.*

ATHENS, *October 23, 1900.*

PATRAS.

ENGINES IN USE.

Gas engines are in use in this district. Till now they have been utilized for small industries, taking the gas from the plant affording light to the town. In all there are in this district 15 gas engines of this kind, of which 11 are used for cleaning currants. Lately, a cotton mill has been constructed, being operated with gas produced by special engine. This machine is of 120 horsepower, and was imported from Manchester (Crossley), and the gazogéne, of 180 horsepower from London (Dawson). The price of these two machines delivered at Patras was £1,800 ($8,760). Shortly, two other engines will be installed, one of 14 horsepower and the other of 35. Prevailing prices of the gas engines delivered at Patras, are as follows:

Horsepower.	Price.		Horsepower.	Price.	
½	£25	$121.66	7	£68	$330.92
2	35	170.33	9½	79	384.49
3½	44	214.13	11	90	437.99
5	56	272.52	15	113	549.91

These machines are imported from the English house of Crossley and from the German house of Otto (Gazmotoren-Fabrik Deutz-Cologne).

OUTLOOK FOR AMERICAN ENGINES.

I think that the introduction of American gas engines would not be difficult, providing their prices and quality be, at least, the same as others. The best means of introduction is to find a competent agent and charge him with the matter.

FUEL.

The available fuel is coke and anthracite and black coal. The average price of coke is 65 drachmas[1] per ton. Gasoline, kerosene, crude and distilled oils are not in use. The cost of coal is now 90 drachmas per ton. On account of this high price and the old system machines in use by several manufacturers, expenses for moving power are 25 to 50 per cent higher than with gas engines. This difference would induce manufacturers to change motors if they could do so on easy terms of payment.

TRANSPORTATION AND FREIGHT RATES.

There are no facilities for transporting directly from the United States, all shipments being effected through Trieste or London. The usual freight is 30s. ($7.30) per ton measurement.

DUTIES.

No custom duties are charged on gas engines.

D. E. Maximos, *Vice-Consul.*

NETHERLANDS.

ENGINES IN USE.[2]

Gas engines are largely used in the Netherlands. They are imported from England and Germany. The brands imported from England are the Bates, Campbell, Stockport, Crossley, Tangye, Leicester, Trysty, Gardner, Dudbridge, and the National. The Otto gas motor is imported from the factory Deutz at Cologne-Deutz. The Otto is higher in price than the English. Those of from 2 to 16 horsepower are principally used in this country.

[1] The drachmas is valued by the United States Treasury at 19.3 cents, but the current drachma is probably not worth more than 16 cents.

[2] Gas engines are admitted into the Netherlands free of duty.

I have succeeded in obtaining only price current of the National gas engines, which states following prices:

Effective horsepower.	Dimensions, length and breadth.	Number of strokes per minute.	Dimensions.		Price.	
			Flywheel.	Pulley.		
	Meters.[1]		*Meters.*	*Meters.*	*Florins.*	
2	1.15 by 0.85	320	0.650 to 0.100	0.200 by 0.100	500	$201.00
3	1.40 by 1.00	280	.800 to .100	.250 by .125	650	261.00
4	1.50 by 1.05	250	.870 to .110	.300 by .150	775	311.55
6	1.80 by 1.20	200	1.100 to .125	.450 by .150	950	381.90
8	1.95 by 1.30	200	1.200 to .135	.500 by .175	1,160	466.32
11	2.25 by 1.40	200	1.350 to .140	.600 by .250	1,350	542.70
14	2.30 by 1.50	200	1.350 to .165	.600 by .250	1,600	643.20
18	2.75 by 1.80	180	1.600 to .180	.750 by .300	1,800	723.60
24	2.80 by 1.85	180	1.600 to .180	.750 by .300	2,000	804.00
30	3.15 by 2.20	180	1.700 to .200	1.000 by .300	2,400	964.80
36	3.25 by 2.25	180	1.800 to .250	1.000 by .350	2,800	1,125.60
41	3.50 by 2.50	160	1.850 to .250	1.400 by .400	3,400	1,366.80
50	3.50 by 2.55	160	1.900 to .250	1.400 by .450	4,000	1,608.00

[1] 1 meter=39.37 inches.

OUTLOOK FOR AMERICAN ENGINES.

A prominent dealer here states that the best means for the profitable introduction of American gas engines into the Netherlands is to appoint a good representative, an engineer preferred, and send him a collection of six or more different engines, to enable him to make a good showing.

A gentleman from the United States, representing large manufacturers of gas engines and electric motors, is now in Amsterdam, and the results of his visit will be noted with interest.

FUELS.

The fuels available in this country are coal and petroleum. The price of English unscreened steam coal is 18s. 9d. ($4.56) per ton of 1,000 kilograms (2,204.6 pounds), cost, freight, insurance Amsterdam. Westphalian unscreened steam coal is quoted at present at 110 florins ($44.22) per carload of 10,000 kilograms (22,046 pounds), cost, freight, insurance Amsterdam.

American petroleum, 10.50 florins ($4.22) per 100 kilograms (220.46 pounds).

TRANSPORTATION AND FREIGHT RATES.

Transportation facilities from the United States to this port are ample. The freight for gas engines quoted by the Holland-America Line is 13 cents per cubic foot. The freight rates by other lines will not materially differ from these figures.

FRANK D. HILL, *Consul.*

AMSTERDAM, *November 28, 1900.*

ROTTERDAM.

ENGINES IN USE.

In the city of Rotterdam (population 330,000) there are at present 265 gas engines in use.

The prices at which gas engines can be purchased here are:

Horsepower.	Price.	Horsepower.	Price.
German:		Netherlands:	
1	$200.00	1 (300 revolutions)	$216.00
2	280.00	2 (300 revolutions)	236.00
3	360.00	3 (280 revolutions)	260.00
4	440.00	4 (280 revolutions)	300.00
5	520.00	5 (250 revolutions)	344.00
6	580.00	6 (250 revolutions)	384.00
8	700.00	7 (240 revolutions)	432.00
10	800.00	8 (240 revolutions)	472.00
12	880.00	9 (220 revolutions)	516.00
English:		10 (220 revolutions)	556.00
3	160.00	11 (200 revolutions)	580.00
4	240.00	12 (200 revolutions)	600.00
5	260.00	16	680.00
8	310.00	20	800.00
11	400.00	30	1,120.00
12	440.00	40	1,440.00
16	536.00	50	1,600.00
20	600.00		

The following are the prices at which "Trusty" gas engines are quoted "at works, Cheltenham, England," with 25 per cent trade discount:

Single-cylinder horizontal engines.

Effective or brake horse-power.	Price of engine only.		Extra for water vessel.		Size of fly wheel.		Standard size of pulley.		Minimum over all dimensions (Engine only).		Approximate net weight of engine.	Speed.
	English money.	United States money.	English money.	United States money.	Diameter.	Width.	Diameter.	Width.	Length.	Breadth.		
	£ s.		£ s.		Ft. in.	In.	In.	In.	Ft. in.	Ft. in.	Cwts.	
2¼	£48	$233.59	2 0	$9.73	2 8	3	10	5	4 2	3 3	8	300
3¼	59	287.12	2 10	12.16	2 8	3½	12	5	4 6	3 4	12	280
4½	68	330.92	3 0	14.60	3 10	4	15	6½	4 10	3 6	15	260
7	78	379.59	3 0	14.60	4 5	4½	18	7½	6 2	3 10	21	240
8½	92	447.72	3 0	14.60	4 6	5	18	9½	6 8	4 3	26	230
11½	100	486.65	6 0	29.20	4 8	5½	22	10	7 6	4 11	33	230
13½	106	515.35	6 0	29.20	4 8	5½	22	10	7 8	5 0	40	230
16	125	608.31	8 0	38.93	5 0	6	24	11	8 6	5 2	52	220
18	136	661.84	9 0	43.89	5 0	6	30	12	9 0	5 3	70	220
22	165	802.97	(1)	(1)	5 6	6½	36	12	10 0	5 10	95	210
30	187	910.04	(1)	(1)	6 0	7	48	14	11 6	6 6	115	200
40	300	1,459.95	(1)	(1)	6 6	7½	54	16	12 6	7 3	145	180

[1] Special prices, according to position.

A small percentage of the gas engines in use is manufactured in the Netherlands; the residue is imported from England, Germany, France, Belgium, and the United States. Formerly the French gas engine "Otto" was much in demand, but for the last ten years English gas engines, constructed after the "Otto" pattern, have been taking the lead.

It is estimated that 200 gas engines, of from one-half to 20 horsepower, are annually imported into the Netherlands. Of every 100 gas engines imported probably 75 are of British, 15 of German, 5 of American, and the rest of French and Belgian manufacture.

The principal manufacturers of gas engines in the Netherlands are: D. W. Van Rennes, Utrecht; Johan Hillen, Blerik; Machinen Motoren Fabriek "Gelria," Arnhem; G. A. Alsche & Co., Arnhem; Arnhemsche Machinenfabriek, Arnhem; Johan Aberson, Olst; and Motorenfabriek, near Delfzijl.

Although it is claimed by some that the production of Dutch gas engines is increasing and that these engines will eventually successfully compete with the foreign engines, it is evident that preference is given to foreign, especially English, gas engines.

OUTLOOK FOR AMERICAN ENGINES.

Dealers claim that if American manufacturers were willing to push gas engines, equally good or better than the Crossley or Tangyes brands here, and, if possible, offer them at lower figures, they might find the Netherlands a fair market.

The principal importers of gas engines at Rotterdam are: Hausmann Brothers, Kasteelen & Cleton, Pellissier Brothers, Post van der Burg & Co., Hugo Reisiger, Van Rietschoten & Houwens, Wynmalen & Hausmann, Bouwman & Co., H. C. van Mens, H. G. Aikema & Co.

FUEL.

The fuels available in the Netherlands are coal, peat, petroleum, and gas.

The prices of coal per 10,000 kilograms (10 metric tons) are as follows: Westfalian delivered at Rotterdam—steam coal, unscreened, $38; double screened, $45.20; small, $34; bunker coal (generally composed of 50 per cent unscreened steam coal and 50 per cent unscreened fat coal), $37.20; Westfalian foundry coke (preferred to any other kind of coke), $68.80.

Peat is sold at about $2 per 1,000 blocks, but is not, as far as I know, used for boiler-heating purposes.

Petroleum in bulk is quoted at $3.40 per 100 kilograms (220.46 pounds), which is equivalent to about 10 cents per gallon, duty included. Very little gasoline is sold here, and what is sold commands such high prices that manufactured gas is much cheaper.

Gas is furnished by the Rotterdam Gas Works at 2.8 cents per cubic meter (35.316 cubic feet).

TRANSPORTATION AND FREIGHT RATES.

The facilities for transportation of machinery from the United States to Rotterdam are excellent. Shipments can be made by regu-

lar lines from New York, Philadelphia, Baltimore, Boston, Newport News, and Norfolk.

The Holland-America Steamship Line, plying between New York, Newport News, and Rotterdam, informed me that all freights for Europe were fixed by their general agency at 39 Broadway, New York, but that the freight last paid for gas engines was 13 cents per cubic foot.

Messrs. Hudig & Pieters, agents of the Cosmopolitan Line, which plies between Philadelphia and Rotterdam, and Messrs. William H. Muller & Co., agents of the Holland-Boston line, which plies between Rotterdam and Boston, have informed me that the freight rates can only be ascertained from the agents of the steamship companies mentioned, in Philadelphia and Boston.

Messrs. Hudig & Blokhuyzen, agents of the Neptune Line, plying weekly between Baltimore and Rotterdam, state that freight rates from Baltimore to Rotterdam for machinery of no extraordinary dimensions are at present 10 cents per cubic foot, and that the landing charges at Rotterdam are 16 cents per 1,000 kilograms (1 metric ton).

S. Listoe, *Consul.*

Rotterdam, *December 5, 1900.*

RUSSIA.

NORTHWESTERN RUSSIA.[1]

SOURCE OF INFORMATION.

The following information has been mostly furnished me by our principal Riga importer of all kinds of machines, Mr. Hugo H. Meyer, who, as I am aware from former occasions, professes a strong partiality for American machinery in general, a circumstance which renders his opinion on the present question of particular weight.

ENGINES IN USE.

A considerable number of gas engines of all sizes from 1 to 30 horsepower is in use in these northwestern provinces. In Riga alone, 100 or more may be seen. The two systems which struggle for the mastery here are the Otto-Deutz and the Actiengesellschaft vorm Moritz Hille, Dresden. The machines are imported via Lubeck or Stettin, and the freight by rail and steamer may, on an average, be estimated at 50 cents per 112 pounds. Although Mr. Meyer considers certain American engines superior in some respects to the German,

[1] Consul-General Holloway says: "The tariff on engines is 1.40 rubles per pood (72.1 cents per 36.112 pounds). Extra parts imported with the engines 50 copecks (25¾ cents) per pood."

he thinks it would be very difficult to get them introduced here, as the public is accustomed to the German systems and is apt to mistrust novelties.

FUEL.

Besides wood, which is comparatively cheap in Riga, the principal fuel in use—coal—is rather expensive, as it has to be imported mostly from Great Britain, the native coal being unable to compete with the foreign, owing to the distance of the Russian coal district from the provinces. At this moment, the coal prices c. i. f. Riga are per ton: For Newcastle, about 32s. 6d. ($7.90); best Scotch, 28s. ($6.82).

Gasoline is also rather expensive here, viz, $5; kerosene, $2.50, and napthta, $1.90 per 112 pounds.

TRANSPORTATION AND FREIGHT RATES.

Machines sent from the United States to the Baltic ports have, as a rule, to be transshipped in some European port. The freight from American to Baltic ports may be estimated at about from 30s. to 35s. per ton of 40 cubic feet.

The United Steamship Company of Copenhagen, between that city and New York, takes merchandise at through rates for all Baltic ports. The agents in New York are Messrs French, Edye & Co.

OUTLOOK FOR AMERICAN ENGINES.

As regards this city as a future market for gas engines, the prospects must, in general, be said to be rather unpromising, not to mention the expensiveness of the fuel, and especially of gasoline. The city will in the near future be supplied with electricity, and it is to be foreseen that it will hardly be long before this new force will supplant the older and more expensive motors.

CHR. SCHULIN, *Vice-Consul.*

RIGA, *August 31, 1900.*

ST. PETERSBURG.

ENGINES IN USE.

The capacity and high price of gas prevents general use of gas engines in Russia, and the majority of those purchased have been altered for the use of masut (residuum of petroleum), which is sold at from 38 to 40 copecks per pood (19.57 to 20.6 cents per 36 pounds). Contracts are being made for next year at from 43 to 45 copecks (20 to 23 cents) per pound. Masut gives about one and one-half times the heat of the same weight of the best Cardiff coal. The price of residuum has been steadily advancing for the past two years, until now coal is more economical.

There is a large and increasing demand in Russia for petroleum engines that can be started without benzine.

A small number of gas engines are manufactured here, but those in general use are from the Otto-Deutz manufactory, at Cologne, Germany.

The price of the Otto-Deutz at St. Petersburg are: Workshop engines, 4 to 5 horsepower, 1,185 rubles ($610.28); 10 to 12 horepower, 2,275 rubles ($1,171.62); 14 to 17 horsepower, 2,835 rubles ($1,460.02). Engines for electric lighting, 4 to 5 horsepower, 1,350 rubles ($695.25); 10 to 12 horsepower, 2,585 rubles ($1,331.28); 14 to 17 horsepower, 3,195 rubles ($1,645.43), to which must be added the price of freight, boxing, etc.

FREIGHT.

The cost of freight on heavy machinery, such as engines, from the United States is 40s. per ton.

W. R. Holloway,
Consul-General.

St. Petersburg, *September 1, 1900.*

MALTA.

ENGINES IN USE.

Gas engines are used in Malta by two machine shops as a substitute for steam in cases where motion is desired but for a short time, and by a bottling establishment and laundry. Inasmuch as Malta is not a manufacturing place, there being very few factories of any kind here, I do not believe that much business can be done in the way of sales of gas engines. Those used are of English make. As to prevailing prices, reliable information can not be obtained.

FUEL.

Relative to available fuels, I would state that the materials at hand are coal, gas, kerosene, and charcoal. Coal and kerosene vary so much in price that reliable figures can not be given. Gas is supplied at $1.16 per thousand feet. Gasoline is among the articles prohibited from entering, it being a product of petroleum and flashing below 70°.

TRANSPORTATION AND FREIGHT RATES.

Facilities for shipment of machinery are ample, there being a direct line (the Mediterranean and New York Steamship Company,) between New York and Malta. Freight rates vary from 25s. per ton upward. There is no duty on machinery, but there is a small landing charge.

John H. Grout, *Consul.*

Valletta, *December 13, 1900.*

SPAIN.

ENGINES IN USE.[1]

There are only three towns in the Carthagena consular district which have gas works, and until recent years, the gas was only supplied at night for illuminating purposes.

When electric lighting came into vogue and cut into the business of the gas companies, the latter at once reduced their prices and offered gas for industrial uses during the daytime.

This is an agricultural and mining section, not manufacturing; and I do not think there is much opening for the sale of gas engines.

FUEL.

With regard to fuels, I give the same quotations which I supplied last May in another report, for, although coal is now dearer, I do not think it would be fair to take present exceptional values as a basis for comparisons. Cost of fuels may be taken as follows: Coal, 36 cents; charcoal, $1.05, and kerosene, $7.45 per 100 pounds; gas, 6 cents per cubic meter (35.316 cubic feet).

OUTLOOK FOR AMERICAN ENGINES.

If I wanted to introduce gas engines (which have not been seen by one in a thousand of the people here), I would rent a small store in a prominent street, mount an engine just inside the window, and keep it running. There would always be a crowd looking at it, and many people would want to know all about it.

To provide for them, I would get up a little pamphlet in Spanish, free from technicalities and as concise as possible, calling attention to the leading points—economy, cleanliness, and absence of risk; prices of the different sizes, in Spanish currency, free on board in the harbor or delivered in the city.

The fact is that, from the manufacturing and commercial point of view, the United States is little more than a geographical expression to the majority of Spaniards. They read of American inventive skill, of the wonderful industrial development and colossal wealth of the United States, but when it comes to buying something, they get it from England, Belgium, Germany, or France.

Another great drawback to trade is the custom adopted by most American exporters of quoting in American money, free on board in

[1] Consul Bowron says: Customs duties on gas engines entering Spain from countries with a treaty of commerce are 18 pesetas per hundred kilograms, gross weight, i. e., packing included. This, taking the gold premium at 29¼, equals $27.28 per metric ton. From countries without a treaty (including the United States), the duty is 21.60 pesetas, equal to $32.74 per ton.

a United States port, and asking for cash against shipping documents. This compels the Spaniard to convert United States currency into sterling or French money and then into Spanish currency. Few of them can do it, and none of them like to. Therefore, in the doubt as to what goods will finally cost, when they will arrive and what they will be like when they do turn up, most folks prefer to keep on in the old track, buying a known article at a known price from European houses who do not hesitate to sell them all they want on three months' credit.

These remarks apply not only to machinery, but to most other manufactured goods.

TRANSPORTATION AND FREIGHT RATES.

Regarding facilities for transportation from the United States, I may say there are none. Goods have to be shipped to some other European country, thence reshipped here, which means paying two freight rates, two insurances, transshipment charges, and involving extra-heavy packing to stand all the knocking about.

Shipping agents say that there is not sufficient inducement in the American trade for steamers to call regularly at Spanish ports, and probably they are correct.

JOSEPH BOWRON, *Consul.*

CARTHAGENA, *September 12, 1900.*

CATALONIA.

ENGINES IN USE.

In the towns situated in the manufacturing province of Catalonia, and generally throughout Spain in those towns where a supply of gas is available, gas engines have been used to a considerable extent. At the present time, owing to the introduction of electricity as a motive power and illuminant in most of the large cities and also in many small towns and villages where the current can be generated at low cost by means of water power, electric motors are replacing gas engines, and are being put up in places where lack of the necessary supply of gas prevented gas engines from being used before. Since the introduction of electricity into Barcelona about two years ago, over 1,000 electric motors have been fitted up in this city, and these have in the main replaced the same number of gas engines. It is impossible to give any accurate statistics of the number of gas engines annually imported into Spain, as they are grouped together with other engines in the official custom-house reports. I have called on the leading importers here, and they tell me that in their opinion not more than 50 to 60 gas engines are bought annually in Spain.

These comprise engines imported from England, Germany, and France, as well as those made in Spain.

The largest size engines are chiefly imported from England, principally of Crossley's make. Germany comes next with Otto's engines; only a very few are of French make.

Most of the gas engines are worked by the ordinary illuminating gas; the larger sizes by Dowson or water gas; very few by gasoline or kerosene.

Gas engines of 4 to 10 horsepower are sold here at from $400 to $700.

FUELS.

The difficulty of obtaining the same grade of oil tells against the regularity of work in the motors. The prices are, besides, almost prohibitory. For instance, gasoline is to-day 25.40 pesetas (about $4.02) per 220.46 pounds, delivered within the bounds of the city of Barcelona, being without the municipal tax ($3.40).

The usual fuel used here is coal, the best qualities having up to the present been imported from Great Britain, from the south of France, a limited quantity from the mines in Catalonia, and a large supply from the Asturian mines, in the northwest of the Peninsula.

The following are the present prices for boiler coal on the Barcelona market, per metric ton of 2,204.6 pounds:

Cardiff (20 per cent screenings), 75 pesetas ($12); Cardiff commercial (mixed), 60 pesetas ($9.60); Glasgow and Newcastle, 60 pesetas ($9.60); Asturian, screened, 65 pesetas ($10.40); unscreened, 55 pesetas ($8.80). The coal sold as "commercial Cardiff" contains an admixture of Spanish coal or other combustible (or noncombustible) material, arranged by the Spanish coal dealers for those of their customers who look more to price than quality. Wood is so scarce and dear that it can no longer be looked upon as fuel.

TRANSPORTATION.

There is regular and direct communication by steamer from New York to Barcelona.

DUTY.

Landing charges and expenses are calculated to amount to about 4 pesetas (64 cents) per 100 kilograms (220.46 pounds), plus the duty, which is 21.60 pesetas ($3.46) per 100 kilograms from nontreaty countries and 18 pesetas ($2.88) from those enjoying the most-favored-nation tariff.

MADDIN SUMMERS,
Vice-Consul-General.

BARCELONA, *August 21, 1900.*

GALICIA.

ENGINES IN USE.

It is not long since gas engines were introduced into this district. There are at present some 70 or 80, of different systems, in use, either for industrial or private purposes. Preference is given to the French "Triel" and to the English "Hockport" and "Crossley" motors, which are generally fed by poor gas, from anthracites. The sizes commonly used vary from 1½ to 35 effective horsepower, and prices range between £35 ($170.33) and £190 ($924.65), f. o. b. in England or France.

The "Crossley" motor is sent free of all expense and risk, to the principal ports of Spain, payable in francs. For instance, a horizontal, 1-cylinder, 4 effective horsepower "Crossley," weighing about 1,117 kilograms (2,462 pounds), is delivered for 2,126.25 francs ($410.36), and the same engine, 14 effective horsepower, weighing about 3,048 kilograms (6,720 pounds), costs 4,725 francs ($911.92).

AEROGEN ENGINES.

I understand that arrangements are being made by several of the fish-preserving concerns established on this coast, for the production of aerogen gas—system of Van Vrielant, of Hanover—and it seems they will soon be fitting up engines adapted to the use of this fluid.

FUELS.

The fuels available in this region are Spanish (Asturian) and English coals, coke, and anthracites, gas, petroleum, and gasoline. The consumption of gasoline is very limited.

Coal prices are abnormally high—30s. to 32s. ($7.30 to $7.79) for Spanish and 40s. to 44s. ($9.73 to $10.70) for English, delivered at the factories. Petroleum and gasoline obtain about 44s. per 100 kilograms ($10.70 per 220.46 pounds).

TRANSPORTATION AND FREIGHT RATES.

General freight from Liverpool, London, or Hamburg to Corunna or Vigo is subject to variation—15s. to 20s. ($3.65 to $4.87) and 5 per cent primage per ton (2,240 pounds). Heavy pieces of machinery pay extra freight.

As there is no direct steam communication between the United States and the northwestern coast of Spain, American goods are generally introduced via England or Germany, and cotton is at times imported via Liverpool, although the cost is about $10 per ton higher.

JULIO HARMONY, *Consul.*

CORUNNA, *September 11, 1900.*

MADRID.

ENGINES IN USE.

English and continental manufacturers supply the very few gas engines that are demanded, through local agents long established here.

FUEL.

The prices for coal and coke in this consular district are very high. For instance, Spanish coals from the districts of Asturias and Leon are sold at 60 to 65 pesetas, or, say, from $11.50 to $12.50 per ton of 2,204.6 pounds; Spanish coke at $14.50 per ton, and English coke at $16.40 per ton.

Petroleum of any kind, being subject to such high taxes, is out of the question as fuel; it comes in cans holding 16 liters (about 3½ gallons), the selling price being about $1.60 per gallon.

OUTLOOK FOR AMERICAN ENGINES.

If importations of American gas engines were possible, the same comments repeatedly made with relation to other merchandise from the United States are here applicable. Without any commercial treaty between the United States and this Kingdom, the nonconvention rates of duty would have to be paid.

This consulate is in constant receipt of circulars and communications from manufacturers of all lines, among which may be mentioned pumps, valves, files, boots and shoes, surgical instruments and appliances, arc and other electric lights, electric machinery, windmills, etc. These are referred to some agency in the respective lines, and almost invariably the reply is that they are unable to undertake the business, the fact being that they are already engaged to English and continental makers.

TRANSPORTATION.

The transportation to this country of American manufactures would be no obstacle, the difficulties to be overcome being the extra duties to be paid and the occupancy of the market by manufacturers of other countries.

DWIGHT T. REED,
Vice-Consul.

MADRID, *August 18, 1900.*

MALAGA.

ENGINES IN USE.

Gas engines are but little used in this consular district. As far as I have been able to learn, there are less than fifteen in Malaga. These are found generally in the shops of lithographers and printers and in

ice factories. Some have been recently exchanged for electric motors. I can obtain no definite information as to the prevailing prices of the class of engines indicated in the circular. The few engines that are here were imported by agents, two or three years ago, from London and Birmingham.

OUTLOOK FOR AMERICAN ENGINES.

The outlook for trade in gas engines is not particularly bright. Owners of plants are more or less conservative and not prone to introduce modern machinery. There are several instances in which machinery of one class or another have been purchased by Malaga parties from abroad. The manufacturers, however, did not send experts to set them up and explain their technicalities, and as they were beyond the understanding of the local engineers and mechanics, the purchasers were forced to abandon them and return to primitive methods.

Manufacturers here seem to prefer to work along in the way of their fathers rather than spend money on a doubtful issue. The lesson, then, is obvious: If the manufacturers of gas engines in the United States wish to introduce their machines into Malaga, agents certainly must be on the spot to study conditions and the wants of those interested.

Catalogues in Spanish are very good in their way, but in a business of this nature, it is of the greatest importance to have at hand skilled representatives who not only know how to sell engines, but, if necessary, are able to teach the local engineers how to run them.

FUEL.

There is plenty of coal here, but it is very dear, with no prospect of being cheaper. Most of the coal comes from Cardiff and Newcastle, and these cost on the quay in Malaga, respectively, per metric ton: Cardiff steam coal, 34s. ($8.28), and Newcastle steam coal, 31s. ($7.55). The high price of coal, I might add, is causing some anxiety among the local manufacturers.

Kerosene retails at about $4.35 per tin. Gasoline is but little used and has no significance as a fuel.

TRANSPORTATION AND FREIGHT RATES.

Unfortunately, there is no direct steamship line between New York and Malaga and other Spanish ports. From time to time, direct boats arrive here from New Orleans loaded with cotton and staves, but these are not frequent.

In Mr. Bartleman's report on "Extension of United States trade with Spain," dated March 10, 1900, and printed in advance sheets of

Consular Reports, No. 779, July 13, 1900, there is set forth the advantages of a direct steamship line between the United States and Spain; and if this is ever realized, there will be, undoubtedly, a great impetus given to the importation of American wares. The absence of a commercial treaty, lack of direct communication, and the high freight rates are the only obstacles to a greater trade between the two countries.

THOMAS R. GEARY,
Vice and Acting Consul.

MALAGA, *August 30, 1900.*

VALENCIA.

ENGINES IN USE.

Although the enhanced value of coal during the past two years has militated against the extensive use of gas engines, they are much appreciated in this district, and some 40 are now working in Valencia in small manufactures and house industries. The systems used are all founded on or developed from the "Otto" patent. Some are manufactured in Spain, principally at Barcelona, and others imported. The foreign gas engines most favored here at present are constructed by Crossley, of Manchester, England, and the sizes most in demand are from 1 to 8 horsepower.

The cost of a 2-horsepower gas engine is about $300 for those produced in the country and 20 to 30 per cent more for best foreign makes. The price increases $80 to $100 for each additional horsepower.

FUEL.

Coal, which stood for some time at $8.50 a ton, has now dropped to $6.40, with a further downward tendency. Ordinary illuminating gas, mostly used here for gas engines, costs 3½ cents per cubic meter (35.316 cubic feet). A Paris firm is now offering gasogens (Taylor's patent) to be attached to motors, to which they supply a low grade of combustible gas at an expenditure said not to exceed 1½ pounds of coal per horsepower per hour. But these gasogens, costing $1,800 for 8 horsepower, are too expensive for small capitalists. Petroleum and its derivatives are not available for heating purposes, owing to high cost. A gallon of petroleum is worth 70 cents at present, and all its distillates are equally expensive.

OUTLOOK FOR AMERICAN ENGINES.

The obstacles in the way of introducing American gas engines into this district are the same that handicap importers of every kind of merchandise from the United States, viz, the want of direct, cheap, and rapid transport facilities. The duty on gas engines is $24.50 per ton, if coming from countries enjoying treaty rights with Spain; and if it

could be proved that the engines imported from such countries are to be applied in any way to agricultural development, the duty is merely nominal. As the United States has no commercial treaty with Spain at present, all machinery coming thence to this country pays a duty of $31 per ton.

I have seen a freight rate for 1½ tons of carriage springs forwarded recently from New York to Valencia, via Liverpool, amounting to $18; yet, even after paying this enormous freight, the springs could still compete in prices with those imported from France and Belgium.

TRANSPORTATION AND FREIGHT RATES.

With regard to freight, there is no fixed rate; instead, there is a variety of tariffs, depending on the quantity of cargo offered and the transshipping expenses necessitated by the absence of direct transport. In no case, however, would freight under present conditions be less than $6 a ton for small quantities.

J. L. BYRNE, *Vice-Consul.*

VALENCIA, *January 2, 1901.*

NORWAY.

ENGINES IN USE.[1]

Gas engines are in general use in Norwegian cities, mostly in factories. Engines of from 1½ to 4 effective horsepower are in greatest demand, but larger ones are also employed. While the majority of engines are imported from Germany and England, there is also a local factory for their manufacture in Christiania.

Engines of English and German make are of better finish and are said to be superior in other respects to the Norwegian article. Prices charged are about the same for all three countries.

The prices of gas engines in Christiania are as follows:

Horsepower.	Price.[2]		Horsepower.	Price.[2]	
Norwegian manufacture:	*Kroner.*		German manufacture:	*Kroner.*	
2½	1,150	$308	1½	800	$215
3½	1,350	362	1¾	1,000	268
4½	1,700	456	2	1,200	322
6¾	2,000	536	2¼	1,350	362
9	2,200	600	2¾	1,500	402
11½	2,500	670	3½	1,650	442
13¾	2,850	764	4	1,800	482

[2] With 10 per cent discount for cash.

FUEL.

I am informed that the cost of running a gas engine in the city of Christiania is 7½ ore (2 cents) per hour for every effective horsepower.

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[1] The Norwegian import duty on machinery is 10 per cent ad valorem.

The price of American petroleum, 120°, is 14.75 kroner ($3.95), and of Russian petroleum, 120°, 13.75 kroner ($3.68) per 100 kilograms (220.46 pounds). These prices are for lots of 10 barrels or more, without extra charge being made for barrels and with 2½ per cent off for cash.

The prices charged for coal in Christiania are fluctuating. At the present writing, the prices are, per ton: Newcastle steam, 28 kroner ($7.50); Cardiff steam, 37 kroner ($9.92); Scotch steam, 27 kroner ($7.24); Newcastle small, 20 kroner ($5.36).

The use of gasoline is prohibited by law.

Peat, to a small extent, is used as fuel for steam boilers in the rural districts; price can not be given, as it differs greatly in the different localities.

TRANSPORTATION AND FREIGHT RATES.

The best facilities for transportation of machinery from the United States to points in my consular district and to the north of Norway and southern parts of Sweden are by the steamship of the "Det forenede Dampskibsselskab" (formerly the Thingvalla Line), of Copenhagen, which make semimonthy trips from New York to Copenhagen, Christiansand and Christiania. This company also runs a line of steamers between New Orleans and Copenhagen. For cities on the west coast of Norway lying between Christiansand and Trondhjem, goods may, with advantage, be sent via England.

The freight rate on machinery from New York to Christiania is 25s. ($6.08) per ton + 5 per cent.

PETROLEUM ENGINES.

While American gas engines may find a market in Norway, I believe there is a still better field for petroleum engines, which are becoming very popular throughout the country. They sell at—

Horsepower.	Price.[1]	
	Kroner.	
2	1,200	$322
3	1,450	389
4	1,800	482
8	2,400	643
12	2,000	804

[1] With 10 per cent discount for cash.

The cost of running a petroleum engine is said to be about 7 ore (1.88 cents) per hour for every effective horsepower.

OUTLOOK FOR AMERICAN ENGINES.

American manufacturers of gas and petroleum engines can, without risk and at reasonable expense, have their goods displayed at the permanent exhibition establishment of the Alfheim Company, whose address is Alfheim, Pilestrædet 27, Christiania, Norway.

Names and addresses of principal dealers in machinery or other goods will always be furnished on application. If the prices for engines as above given would seem to indicate that our manufacturers are able to compete, an effort should at once be made to secure a good salesman for the goods in Christiania and also in Bergen.

HENRY BORDEWICH,
Consul-General.

CHRISTIANIA, *September 3, 1900.*

SWEDEN.[1]

GOTHENBURG.

ENGINES IN USE.

Machine dealers here claim that there are only a few gas motors in use in Gothenburg. In the larger cities, and in other places where water power is available, electric power is preferred. It is stated that gas motors are, on a small scale, manufactured in Sweden, but the largest number are imported from England (Crossley's, Stockport's, Tangy's), and a few from Germany (Deutz's, Gebr. Körting's). They are used principally by printers, manufacturers of paper bags, etc.

As to prices, I have obtained very meager information. What I have been able to find out is that Crossley's 2-horsepower gas motors cost 800 kronor ($214.40), and their 4¾-horsepower 1,700 kronor ($455.60), with 10 per cent discount, free at Gothenburg; other sizes not mentioned.

FUEL.

I have not heard that any oil except petroleum (for petroleum motors) is used as fuel. The following price quotations may be regarded as only approximately correct: Steam coal, c. i. f. Swedish ports, $5.35 to $7.06 per long ton. The same coal, imported; selling prices, 54 cents per hectoliter (2,838 bushels).

American petroleum, cash, per 100 kilograms (220.46 pounds) excluding barrels: Standard, $3.89; prime white, $4.29; water white, $4.62; white rose, $4.96; Russian petroleum, $3.62; American gasoline, $7.63.

The fuel obtained here in Sweden is wood and peat. Some coal is also mined in the southern part of the country. Coal and coke, petroleum and other oils are imported. Gasoline does not seem to be much known or used here. The price of gas, from the city gasworks, is 10 öre (2.68 cents) per cubic meter (35.316 cubic feet). The price of electric power for small motors is 2 öre (about ½ a cent) per hecto-watt hour.

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[1]The Swedish import duty on gas engines is 10 per cent ad valorem.

FREIGHT RATES.

Transportation and steam transportation facilities with the United States are via England, Germany and Denmark. The freight rates for machinery, from New York to Gothenburg, vary from $6.09 to $8.52, plus 5 per cent per ton, weight or measure at ship's option.

OUTLOOK FOR AMERICAN ENGINES.

The best way to introduce American gas engines here would be, according to my opinion, for our manufacturers to send description, price quotations, and terms, and appoint prominent and energetic firms in Gothenburg, Stockholm, and Malmö, as sole importers or agents. Each agent should represent only one firm producing this class of goods, and the manufacturer should not sell directly to anybody but the appointed agent. This induces the latter to advertise and push the sale of the goods.

PETROLEUM ENGINES.

Petroleum engines are made in Sweden; they are also imported. These engines are used by building contractors and others. A firm here advertises American petroleum motors at the following list prices:

Horsepower.	Price.		Horsepower.	Price.	
	Kronors.			*Kronors.*	
½	415	$111.22	4	1,400	$375.20
1	570	152.76	6	1,870	501.16
2	950	254.60	8	2,340	627.12

The petroleum motors made in Gothenburg seem to be about the same price.

ROBERT S. S. BERGH, *Consul.*

GOTHENBURG, *October 15, 1900.*

STOCKHOLM.

ENGINES IN USE.

There are about 1,000 gas engines in use in this consular district, of the following makes: English—Crossley, Stockport, Fielding & Platt, and the National. German—The Otto and the Kenting. Danish: The Tuxen & Hammend.

The imports into Sweden of gas and petroleum engines in 1898 amounted to $100,000, and the exports, to $25,000.

The imports generally come by water, and the manufacturers have appointed firms in Sweden to act as their agents and to push the sale of their goods. There are practically no American gas engines in use

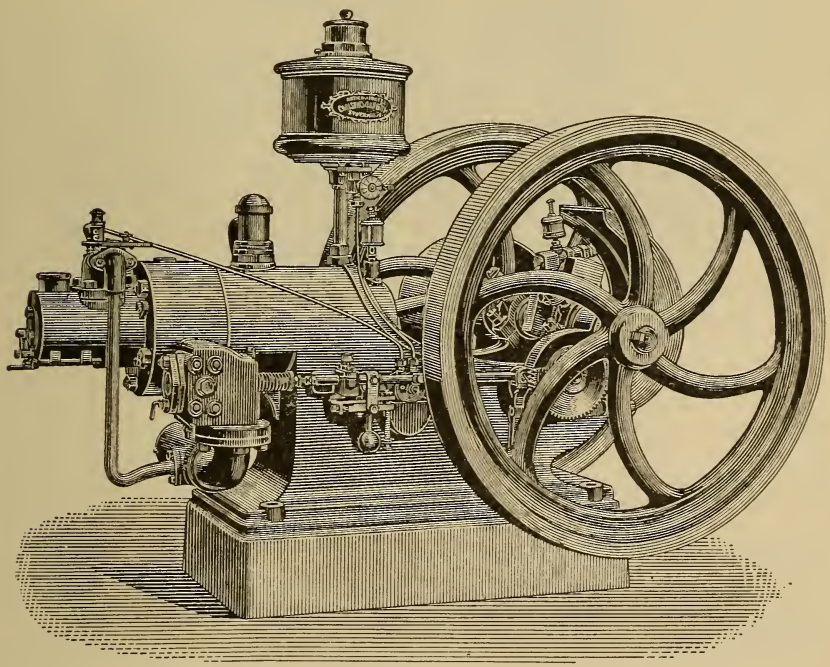


FIG. A.

in Sweden. As regards the possibility of doing business, it is merely a matter of price. An agent must be obtained to represent the engine, and the good points must be equal or be better than those already on the market.

There are no gas engines made in Sweden, but oil engines are being manufactured, a picture of some being subjoined.

Fig. A is a cut of what is called a petroleum motor engine. It is of Swedish make and can be purchased with an indicated horsepower of 20. They range in price from $300 for a 1-horsepower engine to $1,400 for a 20-horsepower engine.

Fig. B shows a portable petroleum motor, the price of which is $550 for a 6-horsepower engine and $900 for a 10-horse. The prices above mentioned are the catalogue figures and are probably shaded somewhat for cash transactions.

Petroleum engines were manufactured in Sweden during the year 1898 to the value of $145,000.

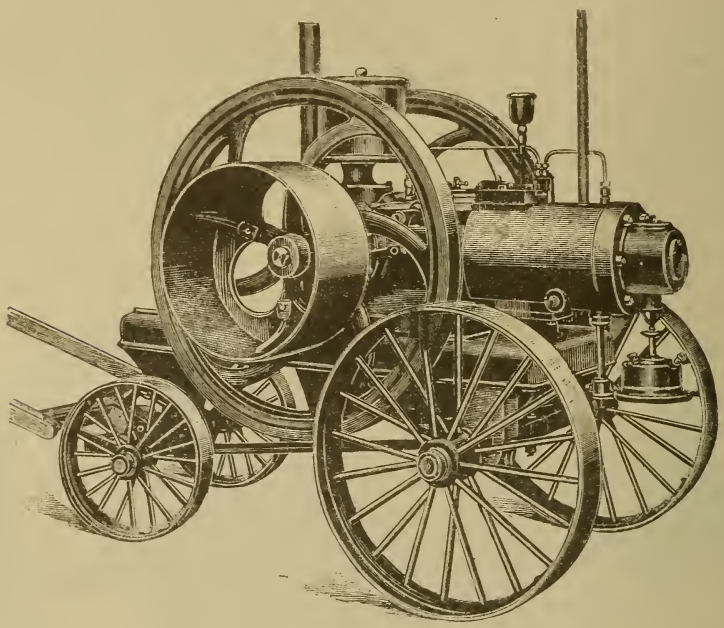


Fig. B.

FUEL.

The fuels used in Sweden are coal (which is imported), wood, petroleum, and manufactured coal gas, the prices of which are as follows: Engine coal, 25 kronor ($6.70) per ton; petroleum, 15 cents per liter (1.0567 quarts); wood, 22 kronor ($5.90) per cord.

TRANSPORTATION AND FREIGHT RATES.

The harbor of Stockholm is deep and accessible most of the year, but no direct communication exists between the Kingdom and the United States. Shipments to this country are made through intermediate ports, which act as clearing houses for Scandinavia, Finland, Russia, etc. The principal ports of this character are Hull, London, Liverpool, Copenhagen, Stettin, Hamburg, and Bremen.

The freight on machinery is very variable, but the last American machinery that came into this port paid 27s. 6d. ($6.69) per English

ton, or per 40 cubic feet, at the ship's option, with 5 per cent added for primage. Marine insurance is 75 to 90 cents per $100.

EDWARD D. WINSLOW,
Consul-General.

STOCKHOLM, *September 24, 1900.*

SWITZERLAND.

ST. GALL.

ENGINES IN USE.[1]

There are a few gas motors in some of the larger towns where gas can be had, but even there petroleum and benzine motors are given the preference, as, it is claimed, they can be run at less cost. The main reason gas motors are not more in use in this consular district is because it consists mostly of small towns, where no gas is to be had.

Gas motors are manufactured in Switzerland by several large establishments; others are imported, mostly from the "Gas Motor Fabrik" in Deutz, Germany. How many are imported, and their value, can not be ascertained, as Swiss official statistics give only the value of all kinds of imported machines together. The engines mostly used here are from 2 to 6 horsepower, but there are also many all the way up to 150 horsepower.

FUEL.

The following is the St. Gall present wholesale price for the different fuels used:

Gas for mechanical purposes, 20 centimes (4 cents) per cubic meter (35.316 cubic feet).

Benzine, according to quality, from 25 to 30 francs ($4.80 to $5.80) per 100 kilograms (220.46 pounds).

Petroleum, Russian, the only kind used here for mechanical purposes, 18.50 francs ($3.60) per 100 kilograms; American petroleum, 19.50 francs ($3.80) per 100 kilograms.

Wholesale quantities of petroleum, benzine, etc., are not sold by the liquid measure, but per kilogram, not including barrels.

Coal, per ton, by the carload, for industrial purposes, $8.50 per ton; hard coal, $10.40; coke, $12.50.

OUTLOOK FOR AMERICAN MACHINES.

In my opinion, the best means by which American machines may be introduced into Switzerland would be to have an agency established in

[1] The Swiss customs tariff on machines of all kinds, except locomotives, is 4 francs per quintal (77 cents per 220.46 pounds).

Zurich, the largest Swiss commercial and industrial city. In this manner, engines from the German motor factory in Deutz have met with great success in Switzerland.

JOSEPH SIMON,
Vice and Deputy Consul-General.

ST. GALL, *August 29, 1900.*

TURKEY.

CONSTANTINOPLE.

ENGINES IN USE.[1]

There are only five or six gas engines in this city. These are of Belgian and Swiss make, and are used for driving small machines in printing shops and similar establishments. Gas engines of sufficient power to propel a 60 or 80 foot launch against the Bosphorus current, which varies in rate from 4 to 6 miles an hour according to wind conditions, ought to find a good market. Most of the launches now plying on the Bosphorus and the Golden Horn are steam propelled. The Turkish ministers and foreign ambassadors are possible buyers. The most feasible plan for introduction is to provide the object lesson of a gas-propelled launch which can develop more speed than the steam launches now in use.

FUEL.

The available fuels are soft coal, petroleum, and gasoline. Turkish coal of inferior quality sells in Constantinople at an average price of $3 per ton; petroleum, at $1.25 per case of 10 gallons. Gasoline is not a commodity in this market.

FREIGHT.

Freight rates depend largely upon directness of transportation.

FRANK L. DULEY,
Deputy Consul-General.

CONSTANTINOPLE, *September 19, 1900.*

PETROLEUM ENGINES IN TURKEY.

Consul Hughes, of Coburg, Germany, under date of October 15, 1900, reports:

In addition to my report of August 27 on "Gas engines," I beg to say that, according to information received from a reliable source,

[1] The duty on gas engines is 8 per cent ad valorem.

Turkey is a favorable market for petroleum engines. Thus, Belgian manufacturers have of late successfully tried to sell such engines to small flour mills situated in the interior of that country. In one instance, 14 Belgian engines, from 2 to 12 horsepower, were sold within a few days to small towns in the province of Macedonia. Engines of simple construction, but very solid in all their parts and for the use of ordinary petroleum, are mostly in demand. The power produced and the fuel needed by engines must be warranted at the time of sale. As a rule, the contract or bill of sale calls for the manufacturer's representative taking charge of the first installation and seeing that the engine runs smoothly and does its work well.

UNITED KINGDOM.[1]

BELFAST.

ENGINES IN USE.

Gas engines are very largely used in Belfast for small-power purposes, viz, hoisting, working presses, and running dynamos. They are manufactured wholly in England. All gas engines used in Belfast come direct from England, via some channel port. The latest list of prices that I have been able to obtain is as follows:

Brake or effective horsepower.	Price without water vessels.	Extra for water vessels.	Sizes of fly wheels.		Standard size of pulley.		Minimum over all dimensions, engine.		Approximate net weight of engine.	Speed revolution per minute.
			Diameter.	Width.	Diameter.	Width.	Length.	Breadth.		
Vertical:			*Ft. ins.*	*Ins.*	*Ins.*	*Ins.*	*Ft. ins.*	*Ft. ins.*	*Cwt. qrs.*	
1½	$184.93	$9.73	3 1½	4	10	6	3 6	3 2	12 0	220
5	301.72	14.60	4 0	5	18	7	4 3	4 0	26 3	200
Horizontal:										
1½	170.32	7.29	2 4	2¾	9	5	4 0	2 7	8 1	250
2½	194.66	9.73	2 11	3	10	6	4 9	3 0	12 0	250
4	272.52	12.16	3 1	3¾	14	6	5 3	3 6	17 2	250
6	330.92	14.60	3 6	4	16	7	6 10	4 4	27 1	220
8	384.5	17.03	3 10	4	18	8	7 0	4 6	29 0	220
11	437.98	19.46	4 3	5	21	8	7 9	4 10	40 2	200
13	501.25	21.89	4 3½	5	21	10	8 0	5 3	42 0	200
16	569.38	24.33	4 8	5½	27	12	8 3	5 6	53 2	190
18	622.91	29.20	4 8½	5½	27	12	8 6	5 7	56 0	190
22½	695.91	36.49	5 3	6¼	36	12	9 0	6 0	74 0	185
25	802.97	38.93	5 3	7	36	12	9 4	6 4	84 3	185
32	875.97	48.66	5 4	7	48	14	10 0	6 6	95 2	180
37	948.96	58.39	5 5	7⅛	48	14	10 3	6 10	106 1	180
43	1,143.63	73.00	6 0	9	54	16	10 9	7 3	131 1	170
51	1,508.62	97.33	6 6	10	54	22	11 6	8 6	151 2	160
63	1,873.60	121.66	7 0	11	(*a*)	(*a*)	12 9	9 0	190 2	160
83	2,287.25	(*b*)	7 6	12	(*a*)	(*a*)	14 2	10 0	270 0	160
100	2,481.92	(*b*)	8 0	13	(*a*)	(*a*)	14 10	10 6	320 0	160
115	2,822.57	(*b*)	8 6	14	(*a*)	(*a*)	15 6	11 3	370 0	160
125	3,406.35	(*b*)	8 8	14	(*a*)	(*a*)	16 0	12 0	395 0	160

a Special pulleys to suit. *b* Special tanks to suit position.

FUEL.

I am advised by those engaged in the trade that no gasoline, crude oil, or distillates are imported into the city. The principal fuels used

[1] All engines and machinery enter the United Kingdom free of duty.

are Russian petroleum and coal. Present prices of petroleum are as follows: Russian petroleum, 13½ cents per gallon wholesale, 16 cents retail; Royal Daylight, 14 cents per gallon wholesale 17 cents retail.

Coal, per ton: Wallsend Orrel, $6.68; Princess Arley, $6.19; household, $5.71; English gas coke, $7.29.

TRANSPORTATION AND FREIGHT RATES.

Transportation facilities for bringing machinery from the United States to Belfast are excellent. Two lines of freight steamers run fortnightly between Belfast and New Orleans, and Belfast and Baltimore and Newport News. Rates on machinery, as quoted by the managers of the Head Line, would be about 25 cents per 100 pounds, provided there were no very heavy pieces. The rates by the Lord Line, plying from this port to Baltimore and Newport News, are about the same.

OUTLOOK FOR AMERICAN MACHINES.

In order to introduce their engines and compete successfully with the home manufacturers, American firms would first of all have to secure good agents. Then comes a more difficult task in convincing prospective buyers of the superiority of the American make over the home production, and unless this can be done few purchasers will be found, as business men here are of the decidedly conservative kind and would show preference always to a home-made article, if it compared favorably in price and quality with that of foreign manufacture.

WILLIAM W. TOUVELLE, *Consul.*

BELFAST, *September 12, 1900.*

BRADFORD.

ENGINES IN USE.

Gas engines are used in this district very extensively. There is scarcely a trade requiring a limited supply of motive power which is not met by these engines. They are a local production and very few, if any, are imported. The prevailing system is known as the "Otto," which consists of drawing in the mixture of gas and air by an outstroke, compressing by an instroke, firing, and exhausting by the next two strokes. The price of gas is comparatively low, being until recently 2s. 3d. (54 cents) per 1,000 feet, with discount varying from 2½ to 12½ per cent according to the amount consumed. In consequence of the increased cost of coal, the charge has been advanced to 2s. 6d. (60 cents) per 1,000 feet.

Electric motors are gradually superseding gas engines where direct power is required, and are found to be more advantageous and economical, the charges for electricity being, for continuous running, 1d. (2 cents) per unit, and for intermittent, 2d. (4 cents) per unit, net.

The prices of gas engines of the type described have declined considerably of late years and at present are as follows:

Nominal horsepower.	Approximate indicated horsepower.	Dimensions of engines.	Standard size of pulley.	Price.		
Vertical engines:		*Ft. in. ft. in.*	*In. in.*	£	*s.*	
½	1¾	2 0×2 6	9× 4	24	10	$119.22
1	3	2 6×2 9	10× 5	35	0	170.32
2	4½	2 9×2 9	14× 6	47	0	228.72
3	6½	3 3×3 3	15× 6	57	0	277.40
4	8	3 6×3 6	16× 6	70	0	340.65
5	10	4 3×4 3	18× 6	76	0	369.85
Horizontal engines:						
1	3	7 0×4 2	10× 5	38	0	184.92
2	4½	7 0×4 3	14× 6	51	0	248.19
3	7	8 0×4 8	15× 6	67	0	326.05
4	8½	8 6×4 9	16× 6	73	0	355.25
5	11	8 6×4 9	18× 6	79	0	384.45
6	13	9 3×5 6	20× 7	86	0	418.51
8	16½	9 6×5 6	24×10	99	0	481.78
10	20	10 0×5 9	30×12	117	0	569.37
12	26	10 6×5 9	36×12	137	0	666.70

FUEL.

The current prices of oils, etc., are, per gallon:

American deodorized benzoline, 700 specific gravity, 8¾d. (17¾ cents); American ordinary benzoline, 700 specific gravity, 8¾d. (17½ cents); benzine, 730 specific gravity, 9½d. (19 cents); American naphtha, 740 specific gravity, 9¾d. (19½ cents); motor-car spirit, 680–685 specific gravity, 10d. (20 cents); Russian petroleum (kerosene), 825 specific gravity, 6¼d. (12¼ cents); Russian solar distillate, 870–880 specific gravity, £6 5s. ($30.40) per ton.

All the above are packed in barrels of about 40 gallons each; terms, net cash in fourteen days. Ex store, Liverpool or Birkenhead.

Coal used for steam-raising purposes, and known as "rough slack," averages about $3.28 per ton delivered. Locomotive hard steam coal is $4.74 per ton.

TRANSPORTATION AND FREIGHT RATES.

Transportation rates to this country are arranged by the steamship companies in the United States. The railway charges, however, from the nearest seaports, viz, Hull and Liverpool, to Bradford are as follows, per ton, at owner's risk:

Hull to Bradford: Machinery, in parts, packed in cases, 13s. 9d. ($3.34); not packed, 13s. 9d. ($3.34).

Liverpool to Bradford: Machinery, in parts, packed in cases, 17s. 6d. ($4.25); not packed, 17s. 6d. ($4.25).

OUTLOOK FOR AMERICAN ENGINES.

The foregoing price list will enable our manufacturers to judge whether prices admit of the possibility of profitably introducing engines into this district. American engineers' tools are in great demand, owing

to their superior excellence, and if the same can be shown to apply to gas engines (or other equal advantages are offered) there is no reason why a footing may not be obtained, but it will take considerable personal effort on the part of those who may consider it worth while to make the attempt. As an illustration of what can be done when it has been decided to introduce an article, I would mention that recently, a Vermont house resolved to have its stone-sawing machines placed on the market here. The managers were unable to induce any local firm to take the matter up, so they dispatched a representative with a machine, which was erected by permission in a quarry near the city. Invitations were sent out to interested parties to witness several exhibitions in the cutting of the various classes of stone, and the advantages of the machine were thoroughly demonstrated before practical men. The agent informed me prior to returning that he was well satisfied with the result of the mission.

T. Learins Renton,
Vice and Acting Consul.

Bradford, *October 11, 1900.*

CARDIFF.

ENGINES IN USE.

Gas engines are extensively used in this district.

The prevailing prices were refused me by the merchants, as they considered the matter their private business.

These gas engines are brought into Cardiff from Manchester and Birmingham and go under different names. The Otto gas machines, sold by Crossleys, Manchester, range from 3 to 400 horsepower. The same may be said of the Tangyes engine, Birmingham, though I am informed by one firm in this town that the Tangyes engines range beyond those figures. The other engine is named the Ideal; its capacity is small, ranging from 1 to 6 horsepower.

The oil engines in use are the Hornsby's Aeroid engine and the Priestman's Aeroid engine.

OUTLOOK FOR AMERICAN ENGINES.

While my informant assures me that there is no chance for American competition, I respectfully suggest that the safest plan for securing surest information is for the interested firms engaged in the manufacturing of gas engines to depute one of their representatives to come over and ascertain for themselves.

FUELS.

The fuels available are gasoline (called benzoline here), kerosene (called petroleum), and colza. No firm here seems to know anything

of distillates. Oil prices have fluctuated considerably during the past twelve months. Gasoline (benzoline) costs about 11⅝d. (23 cents) per gallon to-day; kerosene (petroleum) 6⅝d. (13 cents) per gallon; colza, 30s. 6d. to 31s. per hundredweight ($7.40 to $7.54 per 112 pounds) for French and Stettin in barrels.

TRANSPORTATION AND FREIGHT RATES.

There is every facility for transportation of machinery from the United States to this district, but there is no American shipping; and until we have American ships, we can not expect any improvement in American trade so far as this country is concerned.

DANIEL T. PHILLIPS, *Consul.*

CARDIFF, *September 5, 1900.*

DUBLIN.

ENGINES IN USE.

Gas and oil engines are used in Dublin and in Ireland generally, though not to any large extent. These engines are built on the "Otto" principle, and vary in size from one-third to 400 horsepower. One of the largest firms quoted me the following as its present list prices: For engines of 1 horsepower, $300; 2 horsepower, $350; 100 horsepower, $3,500; 120 horsepower, $3,800; 135 horsepower, $4,600; 180 horsepower, $5,400; 1,400 horsepower, $14,000. These prices are, of course, subject to discounts, but no firm would say just what the discounts are. Price lists for the use of the general public are not issued, there being a separate quotation for each engine. In one catalogue, I find the terms for the home trade given as follows: "Cash by the 10th of the month following the date of invoice, for which (unless quoted net cash) a discount of 2½ per cent is allowed." Carriage is paid to the limits of free railway delivery.

The principal makers are Crossley Brothers, and Tangyes, both British houses. No foreign engines are imported.

The gas engines use ordinary coal gas, and the oil engines petroleum. No gasoline is used, as the insurance companies charge almost prohibitive rates on buildings where it is handled, and the railways practically refuse to carry it. The oils used are the several varieties of petroleum known as "Royal Daylight," "White Rose," etc.

FUEL.

The fuels available are coal, coal gas, and petroleum. Coal retails at from $6 to $7.50 a ton; gas is 80 cents a thousand feet; petroleum sells at 17 cents a gallon by the barrel, and 15 cents a gallon in larger quantities

I am told that the gas company allows purchasers of certain engines 25 per cent, in cash, of the price paid for the engine. The purchaser of the engine pays the maker the full price and then takes his invoice to the gas company, which hands him 25 per cent of the purchase money. This is a point that must not be overlooked by intending exporters.

TRANSPORTATION AND FREIGHT.

Transportation to Dublin from the United States is fairly good. There is a direct line from Baltimore to Belfast and Dublin, and there are occasional steamers from Newport News direct to Dublin. The shipping facilities via Liverpool and Glasgow are good. The through rates to Dublin can be better ascertained in the United States than here.

The railway rates vary according to the class of goods, but are generally exorbitant as compared with those in force in the United States. They are not published.

OUTLOOK FOR AMERICAN ENGINES.

Owing to the small number of engines required, or thought to be necessary here, this can hardly be considered a promising market. However, if our makers can place engines on this market that are as effective, while simpler or cheaper than those at present sold, they could certainly command a fair share of the trade. To get a footing, it would be necessary to send an engine with a man who understands it, and show by demonstration what the engine can do. Catalogues are practically useless.

A. DONN PIATT, *Acting Consul.*

DUBLIN, *November 6, 1900.*

DUNDEE.

ENGINES IN USE.

Gas engines are in very general use in this neighborhood. They cost about £15 10s. ($75.43) per brake horsepower, and are almost entirely of Scotch or English manufacture, few, if any, being imported.

FUELS.

The fuels available here are gasoline, costing 18 cents per gallon; kerosene, 22 cents per gallon; crude oil, 22 cents per gallon. For steam boilers, coal is the fuel used, costing from $3.40 to $3.89 per ton.

TRANSPORTATION AND FREIGHT.

There are ample facilities for the transportation of machinery to this district by means of the numerous lines of steamships plying between

the United States and this country. Direct communication between Dundee and New York is carried on by almost fortnightly sailings of the Arrow Line of steamers, freight by which is at present $4.87 and 5 per cent per ton of 40 feet.

OUTLOOK FOR AMERICAN ENGINES.

I am informed that in the local market, there is keen competition among the best makers in Great Britain for the gas engines required in this district. The quality supplied is good and they give satisfaction generally. In some quarters where gas is not easily obtained, oil engines are coming into common use for farm work and other industries. They cost about $7.30 per brake horsepower more than gas engines.

JOHN C. HIGGINS, *Consul.*

DUNDEE, *October 18, 1900.*

DUNFERMLINE.

ENGINES IN USE.

Ten years ago, there were less than a dozen gas engines in use in Dunfermline, and four years ago, when the city purchased and acquired control of the gas works, there were but 21. At present, there are 44 in constant operation and several new ones are about to be added to the list. Gas engines are rapidly growing in popular favor here and in other towns. There are no cities in the district, however, with a population exceeding 25,000.

Gas engines are used here in industries where heavy motive power is not required, and also in extensive works for driving detached pieces of machinery used for special purposes. Quite recently, two of the large linen factories purchased gas engines to run their sewing machines. Gas engines are generally used in the public schools in this section of Scotland, for driving the fanners in connection with the ventilating system. I find they are also used by brass founders, joiners, bakers, printers, aerated-water manufacturers, and other trades, and also as a motor power in connection with dynamos.

Whenever a fair system of gas lighting is introduced in villages or towns here, a demand for gas engines is sure to follow, if the price of gas does not militate against their use. Coal is very abundant, and gas can generally be obtained at a price sufficiently low to warrant the introduction of gas engines, especially in the smaller industries that use light machinery.

There are no imported gas engines in use here. Crossley Brothers, Limited, Manchester, and Tangyes, Limited, Birmingham, appear to hold this market free of any foreign competition.

A 3-horsepower engine working up to 6-horsepower is purchased for £75 ($365), and very recently a 5-horsepower engine working up to 10-horsepower was purchased for £100 ($486.65).

OUTLOOK FOR AMERICAN ENGINES.

American gas-engine manufacturers desirous of competing for a share of this trade should have a good representative in the field all the time, with a supply of gas engines of various sizes at hand ready for a competitive test or trial order; and if under the circumstances our manufacturers feel warranted in attempting to get a foothold in this market, now is the time to enter, as the trade is practically just opening up.

FUEL.

The present price of coal as used here for industrial purposes is 11s. 8d. ($2.84) per long ton, an increase of about 50 per cent within the past year.

Gasoline is not used here; in fact, it appears not to be known.

White Rose oil, imported by the Standard Oil Company, is handled by dealers generally, and retails at 22 cents per gallon.

Paraffin oil, a Scotch product, is in much greater demand, because it is cheaper. It retails at 18 cents per gallon.

The price of gas varies in cities and towns throughout the district, and owing to the unusually high price of coal, it has been advanced in all parts of Scotland. The increased price of gas in Dunfermline for lighting purposes is 95 cents per 1,000 cubic feet. For gas engines, cooking and heating ranges, it is 81 cents per 1,000 cubic feet.

TRANSPORTATION AND FREIGHT RATES.

There are excellent harbors in this consular district at Methil and Burntisland, but the shipping at these places is principally to and from British and continental ports. Machinery from the United States to this district is generally shipped to Glasgow or Leith.

J. N. McCunn, *Consul.*

Dunfermline, *September 15, 1900.*

EDINBURGH.

ENGINES IN USE.

Gas engines are not used in this district to a large extent. They have, however, been adopted at many workshops and factories having only intermittent use for driving power, and have been introduced into large warehouses for handling merchandise. They are used in

public school buildings to run the ventilating apparatus, and some of the hotels also have gas engines to operate in connection with hydraulic elevators. In not a few country hotels and mansions, they are employed to generate electricity for lighting. They are also appreciated at factories where power is required over a greater extent of ground than could be well managed by belt transmission. It is not uncommon for such factories to have several gas engines located at different parts of their premises. This is found more economical than leading steam through pipes, with the resultant loss of power, owing to the steam cooling between the boiler and the place where used.

There are no prominent manufacturers of gas engines in this district. Practically all of the gas engines in use are of English manufacture. They are from the works of the following makers: Crossley Brothers, Limited, of Openshaw, Manchester; Tangyes, Limited, Cornwall Works, Birmingham; William Grice & Sons, Limited, Birmingham; R. Cundall & Sons, Limited, Shipley; and the Campbell Gas Engine Company, Limited, Halifax, Yorkshire.

Most of the gas engines used here are driven by the ordinary corporation illuminating gas, which is made at the Edinburgh-Leith municipal works, and for which during the past five years the price has averaged 3s. (73 cents) per 1,000 feet. At present, close upon 90 per cent of the total gas produced (about 1,800,000,000 feet per annum) is used for illumination, about 10 per cent is used in stoves, and as yet not more than 2 per cent is used for driving engines.

An official who is one of the leading gas engineers in this country expressed to me his opinion that the use of gas engines in Scotland will extend greatly. He is convinced that in this country, no other driving power for certain classes of machinery will ever be so satisfactory as gas, which at present is, and which he believes will always be, more economical than electricity. On the other hand, I have heard of instances where, since the installation in 1895 of electric light for street lighting by the Edinburgh and Leith corporations (the electric-light plant, like the gas works, belongs to the municipalities) quite a number of gas engines in the district have been replaced by electric motors; and I am told that owing to the growing popularity of these motors, the agent of the gas engine company doing the largest business in this locality has been complaining that he finds it increasingly difficult to obtain orders for his company's engines.

The following statement bearing on this question of gas v. electric motors was prepared by Baillie Mackenzie, chairman of the electric-light committee of the town council:

> The increase of the demand for current for motors has been very rapid. During the first year (1895), the current for motors was only 13,877 units; last year it was 579,612. At 15th May last, 451 motors of 1,434 horsepower were joined on. This

has been increased to 526 motors, equal to 1,695 horsepower at 13th October. The users of power are finding out the enormous advantage it is to have power available in such a flexible and convenient form that 8 or 10 horsepower can be carried to any part of a building by two small wires no thicker than a darning needle, and costing only 1½d. (3 cents) per unit, or about 1d. to 1¼d. (2 to 2½ cents) per horsepower hour.

I have been able to obtain price lists of the Cundall engines, which average, I am informed by an engineer, about 25 per cent lower in price than the Crossley.

Price list, horizontal engines.

Horsepower.			Overall dimensions.	Net weight of engine.	Standard size of driving pulley.	Diameter of fly wheel.	Revolutions.	Size of exhaust pipes.	Size of water pipes.	Size of gas pipes.	Price, including driving pulley and exhaust box.	Water tank extra.
Nominal.	Indicated.	Approximate brake.										
			Ft. in. ft. in.	*Cwt. qr.*	*In. in.*	*Ft. in.*		*In.*	*In.*	*In.*	£	£ s.
½	2	1½	5 6 × 2 5	10 0	9 × 5	3 2	240	1½	¾	½	49	2 0
1	3	2½	6 3 × 4 0	18 2	12 × 6	3 9	220	1½	1	½	65	2 10
2	4½	4	7 6 × 4 1	23 0	18 × 6	4 0	200	2	1¼	¾	74	4 0
3	6½	5½	7 6 × 4 1	27 2	18 × 7	4 0	200	2½	1½	1	85	5 0
4	10	8	8 6 × 4 3	36 0	22 ×	4 6	200	2½	1½	1	100	6 0
7	16	13	9 11 × 5 0	54 0	22 × 9	5 0	190	3½	2	1¼	130	9 0
10	22	17½	10 6 × 5 9	64 0	30 × 13	5 2	185	3½	2½	1½	154	10 0
12	26	21	10 6 × 7 0	89 0	30 × 13	5 6	180	3½	2½	1½	180	11 0
14	33	28	10 9 × 7 0	105 0	(1)	5 6	180	4	2½	1½	200	(2)
16	41	34	11 3 × 7 9	138 0	(1)	5 10	180	4½	2½	2	260	(2)
20	49	41	12 0 × 8 2	150 0	(1)	5 10	180	5	3	2	310	(2)
25	64	51	13 0 × 8 9	150 0	(1)	7 0	170	5½	½	2½	359	(2)
30	85	70	14 3 × 9 9	200 0	(1)	7 3	160	6	.....	3	448	(2)
40	100	84	15 6 × 10 6	220 0	(1)	7 3	160	7	.....	3½	.....	(2)

[1] To suit requirements. [2] According to number.

The above prices are for engines on rail at Shipley.

Packing for shipment and delivery f. o. b. English port 5 per cent extra net, half of which is allowed if packages are returned carriage paid.

Each engine is supplied with gas bag, silencing chamber, driving pulley, one spare piston ring, one spare spring of each size, two patent ignition tubes, necessary spanners, etc.

Price list, Cundall patent oil engine (horizontal engines).

Horsepower.			Overall dimensions.	Net weight of engine.	Standard size of driving pulley.	Diameter of fly wheel.	Revolutions.	Size of exhaust pipes.	Size of water pipes.	Price including driving pulley and exhaust box.	Water tank extra.
Nominal.	Indicated.	Approximate brake.									
			Ft. in. ft. in.	*Cwt. qr.*	*In. in.*	*Ft. in.*		*In.*	*In.*	£	£ s.
½	2	1½	5 6 × 2 5	10 0	9 × 5	3 2	240	1½	¾	65	2 0
1	3	2½	6 3 × 4 0	18 2	12 × 6	3 9	220	1½	1	85	2 10
2	5	4	7 6 × 4 1	23 0	18 × 6	4 0	200	2	1¼	105	4 0
4	9	8	8 6 × 4 3	36 0	22 × 9	4 6	200	2½	1½	140	6 0
7	15½	12	9 11 × 5 0	54 0	22 × 9	5 0	190	3½	2	185	9 0
10	19	15½	10 6 × 5 9	64 0	30 × 13	5 2	185	3½	2½	225	10 0
12	24	20	10 6 × 7 0	89 0	30 × 13	5 6	180	3½	2½	255	11 0
14	29	24	10 9 × 7 0	105 0	(1)	5 6	180	4	2½	285	(2)
16	37	30	11 3 × 7 9	138 0	(1)	5 10	180	4½	2½	315	(2)
20	42	35	12 0 × 8 2	150 0	(1)	5 10	180	5	3	370	(2)
25	52	45	13 0 × 8 9	150 0	(1)	7 0	160	5½	.....	430	(2)
30	70	58	14 3 × 9 9	200 0	(1)	7 3	160	6	.....	.....	(2)
40	90	76	15 6 × 10 6	220 0	(1)	7 3	160	7	.....	.....	(2)

[1] To suit requirements. [2] According to number.

Also made in any other size not in above list at proportionate prices.

Portable engines (single cylinder).

[Mounted on strong wrought-iron wheels with shafts.]

Actual or brake horsepower (approximate):	
4	£165
8	225
12	280
15½	325
20	375

The above prices are for engines on rail at Shipley.

Packing for shipment and delivery f. o. b. English port 5 per cent extra net, half of which is allowed if packages are returned carriage paid.

Each engine is supplied with silencing chamber, driving pulley, one spare piston ring, two patent indestructible ignition tubes, one spare spring of each size, one spare lamp, necessary spanners, etc.

Special quotations for larger sizes of stationary and marine engines in all sizes up to 300 brake horsepower.

FUEL.

All ordinary fuels are available in this district excepting wood and natural gas. Gasoline is little used for any purpose. The manager of a large wholesale oil firm informs me that in the past year, it has begun to devote some attention to this product, selling it for mechanical use. His opinion is that under present conditions, it could not be sold here at less than 34 cents per gallon; another merchant quotes it at 43 cents per gallon. Casks represent approximately 2 cents per gallon. The current prices (reduced to American money) per gallon of various other oils are as follows: Refined white shale naphtha, delivered, casks free, 19 cents; kerosene or paraffin, delivered, casks free, 14 cents; "Royal Daylight" petroleum, ex quay, Leith, casks free, 14 cents, net; finer quality of "Royal Daylight," 15½ cents, net; Pratt's deodorized spirit, ex quay, Birkenhead, casks free, 18 cents, net; Pratt's ordinary spirit, ex quay, Birkenhead, casks free, 17¾ cents, net; motor spirit, ex quay, Birkenhead, casks free, 20 cents, net; benzine, ex quay, Birkenhead, casks free, 20 cents, net; crude oil for burning in Lucigen lamps, price at iron works 3 cents, casks extra; the same delivered here, 4 cents, casks extra. The crude oil is used to a small extent for steam boilers. The current prices for steam coal range from 10s. 6d. to 15s. ($2.55 to $3.65) per ton, delivered in Edinburgh and Leith. The present average price paid is about 12s. 9d. ($3.10), being for dross. The price of coal in general to manufacturers has just about doubled within the past two years. The Edinburgh and Leith municipal gas works are at present paying 7s. 6d. ($1.82) for gas coal delivered at the works. Two or three years ago, 3s. 9. to 4s. (91 to 97 cents) was the average price paid by them.

TRANSPORTATION AND FREIGHT RATES.

Steamers of the Arrow Line ply regularly between New York, Leith, and Dundee. There are also fairly regular departures of steamers from Baltimore for Leith, as well as occasional sailings from Philadelphia and other ports on the eastern coast. The port of Leith has

all modern facilities for handling merchandise, and has ample warehouse accommodations. I have been unable to obtain trustworthy information as to freight rates on gas engines from any of the American ports. In response to my inquiries on the subject, I have been told that the rates upon such machinery vary greatly, according to the state of the freight market, and that for reliable quotations it would be necessary to apply to transportation companies in the United States, as all agreements as to rates are made at the shipping ports. However, assuming that gas engines would be carried at a measurement rate, I may mention that by the last Arrow Line steamer which arrived at Leith this rate was 17s. 6d. ($4.25) and 5 per cent per ton of 40 cubic feet. On merchandise brought to Leith via Liverpool, the current freight rate from Liverpool of the leading Leith carrier is 17s. 6d. ($4.25) per ton, exclusive of all dues. The transshipping charges per ton at Liverpool are as follows: Dues, 48 cents. Master porterage, pieces not exceeding 10 hundredweight, 30 cents and 10 per cent; not exceeding 20 hundredweight, 40 cents and 10 per cent; not exceeding 40 hundredweight, 54 cents and 10 per cent. Liverpool cartage, 48 cents.

The shore dues at Leith on such machinery as gas engines amount to 16 cents per ton.

OUTLOOK FOR AMERICAN ENGINES.

Two or three British builders supply the greater portion of the gas engines in use in this district, although I am told by a prominent and disinterested engineer that there are improved engines made by other concerns. His explanation of the continued adoption of engines which have been outclassed for a considerable time, is that the users of gas engines here are not as a rule at all versed in engineering, and when intending to get an engine they do not study and compare the working of different styles, but merely order one of a particular type which some person known to them has used for a number of years and which from long experience he can vouch for as being reliable and lasting. My informant fears that, considering the above facts, it may be difficult for American manufacturers to introduce their gas engines, no matter how many and how obvious their merits; but he suggests that the most promising plan would be for them to induce some prominent firm in each important center throughout this country to admit one of their engines, in order that, in the event of its superiority over similar engines made in this country being recognized by the firm, possible buyers may be referred to the firm to see the engine in operation and for general information regarding its advantages.

So far as I have been able to learn, no foreign-made gas engines are at present sold in this part of Scotland.

The Glasgow International Exposition of 1901 will offer an excellent opportunity for American manufacturers in this line to bring their engines prominently before the buying public in Scotland. I may add that among the effective mediums in the British Islands for advertising light machinery, such as gas engines, are fairs and agricultural shows. The most important of these held in Scotland is the annual show of the Highland and Agricultural Society, which lasts several days and is always held in some important center and seldom, if ever, for two successive years in the same place. Of late years, the exhibits at this show have included gas engines of various makers, who endeavor by practical tests to convince visitors of the merits of their machines.

RUFUS FLEMING, *Consul.*

EDINBURGH, *October 19, 1900.*

FALMOUTH.

ENGINES IN USE.

There are some 15 gas engines working in Falmouth in addition to those in other towns in this district. The sizes vary from 1 manual to 12 horsepower, nominal, and the prices run from $72.99 to $583.98. The chief suppliers are Crossley Brothers & Tangyes, Limited. The gas is manufactured at the various local gas works.

TRANSPORTATION.

There is no direct communication from the United States to this port.

OUTLOOK FOR AMERICAN MACHINES.

As regards the prospect for introducing American gas engines into this country, I would suggest their being shown at exhibitions in various distributing centers in the United Kingdom.

HOWARD FOX, *Consul.*

FALMOUTH, *October 2, 1900.*

LIVERPOOL.

ENGINES IN USE.

Gas engines are extensively used in Liverpool by corn millers, warehouse owners for lifting purposes, printers, and, in a small way, by engineers for driving purposes. About half the power for these works, where under 1-horsepower is required, is gas. Large numbers are also used for electric installation, especially in small shops. The cost

of gas engines varies according to style and description, but about $48.66 per horsepower is considered a fair price. So far as I can learn there are none manufactured in Liverpool, the source of supply being Manchester, Leeds, Yorkshire, and Scotland, but principally Manchester. From inquiries made, I gather that competition among the various manufacturers is severe, which leads to the conclusion that profits are small. There does not appear to be any import of gas engines into Liverpool.

There are very few engines here in which oil is used as fuel; as a matter of fact, oil is only in its experimental stage. What little oil there is in use is petroleum and petroleum spirit, the former costing 11 cents to 12 cents per gallon and the latter 20 cents per gallon. Gasoline and other crude oils are not used as fuel. I understand that the Great Western Railway Company has recently had some engines converted for the use of oil fuel, but the result of the experiment has not yet been made public.

FUEL.

There is a plentiful supply of steamer coal in Liverpool, but owing to an alleged combination, the South African war, and other causes, the prices have greatly increased during the last ten months. The minimum price of such coal now is about $4.13 per ton, against $2.31 in the early part of 1899.

TRANSPORTATION AND FREIGHT RATES.

The facilities for transportation of machinery from the United States are excellent, the rate of freight being about $4.25 per ton measurement, and 5 per cent primage, from New York, and $3.65 to $4.13 for 30 hundredweight, and 5 per cent primage, from Boston. Much, however, depends upon the state of the freight market and the description and measurement of the machinery about to be shipped. Such rates, I am informed, are fixed in the United States.

JAMES BOYLE, *Consul.*

LIVERPOOL, *September 20, 1900.*

MANCHESTER.

ENGINES IN USE.

Gas engines are largely in use in this consular district; there are eleven manufacturers, two of the largest being Messrs. Crossley Brothers, Limited, and Messrs. J. E. H. Andrews & Co., Limited. Messrs. Crossley Brothers, Limited, are the largest manufacturers of gas engines in the world, and their engines are sold in all parts. I

applied to this firm for information, and inclose herein their original reply, in which they refuse to give any information whatever:

CROSSLEY GAS AND OIL ENGINES.

MANCHESTER, *September 21, 1900.*

DEAR SIR: We are in receipt of your favor of the 19th, with inclosure, for which we thank you; but we think that on reflection you will see that the information you ask for is such that we as makers of gas engines, and desirous of keeping out foreign competition, could not well supply.

Regretting that we can not oblige you in this matter, etc.

CROSSLEY BROTHERS, LIMITED.
S. H. IRWIN, *Director.*

W. F. GRINNELL, Esq.,
United States Consul.

The prices, as far as I can obtain information, are as follows: About £25 ($121.66) 1-horsepower, and about £15 ($72.99) per horsepower upward.

TRANSPORTATION AND FREIGHT RATES.

Fuels of all kinds are available in large quantities in this district, but the cost of transportation to Manchester by the Manchester Ship Canal can not be ascertained, owing to the competition between the steamship companies, there being no fixed rates.

OUTLOOK FOR AMERICAN ENGINES.

I give the opinion of a leading Manchester merchant and a user of gas engines, should the United States makers decide to export gas engines to this consular district:

In the event of gas engines being imported into Manchester, the exporter would meet with considerable and very keen competition.

The British Westinghouse Company has taken a very large acreage of land on the Manchester Ship Canal, with the intention of producing the Westinghouse high speed gas engines.

WM. F. GRINNELL, *Consul.*

MANCHESTER.

NEWCASTLE-ON-TYNE.

ENGINES IN USE.

Gas engines are used in this consular district to a very great extent. Among the many purposes for which they are used here are: Electric lighting, elevators, mineral-water works, printing works, bookbindery works, box-making works, engineering works, coppersmithing, brass-founding and finishing, shipbuilding yards, tin and iron plate works, wood turning, confectionery works, wire working, leather works,

machinery-belt works, builders' machinery, lumber sawmills, brick-making, butchers' machinery, grocers' shops, hairdressers' shops, boot-makers' works, glass works, brewing and malting, carpentry works, jam manufacturers, cycle works, carriage builders, rope makers, bone boilers, corn merchants, collieries, etc.

Oil engines are used in country towns and villages, where gas can not be had, for driving various classes of machinery, and on farms (both portable and stationary engines) for driving agricultural machinery; also in collieries, underground, for driving pumping engines, etc. Oil engines are also used for motor cars, small steam launches, etc.

Prices of gas engines vary, according to the maker. Prices of the various makers range from £16 ($78) for one-half brake horsepower to £25 ($121.66) and £30 ($146) for 1½ brake horsepower, £150 ($730) and £165 ($802.97) for 35 brake horsepower and upward to 180 brake horsepower.

Gas engines are made in nearly all the principal engineering cities of Great Britain. There are none imported from foreign countries.

OUTLOOK FOR AMERICAN ENGINES.

The question of the successful introduction of American gas engines into this district depends upon our manufacturers being able to supply as good an engine as, and at a price favorably competing with, those produced here. The matter of freight is, I consider, not an important one.

The best means to introduce American engines would be to advertise them in the trade and ordinary newspapers here, in addition to sending a good practical traveler for the purpose of appointing reliable machinery houses as agents for their sale. An exhibit at local agricultural shows would also prove of great assistance in their introduction.

Certain saleable sizes would require to be stocked, as a gas engine is invariably ordered in a hurry, and the time consumed in placing the order and in its transit from the United States would tell against their sale.

Buyers in this locality usually get a price from the makers covering engine, all accessories, and costs of fixing same ready to start, and as this is the custom here, intending exporters should try and cultivate it—the people here being conservative in their ways.

I inclose a cutting from a local newspaper, giving result of a law trial, decided in Newcastle last week, on this point:

GAS ENGINE DISPUTE IN NEWCASTLE.

This morning, at the Newcastle county court, before his honor, Judge Greenwell, Messrs. Crossley Brothers, makers of gas engines, sued Messrs. John Murdie & Co., millers and grain merchants, for the balance of the price of a gas engine supplied by

the plaintiffs to the defendants. The defendants admitted the claim, but counterclaimed for damages for delay in the erection of the engine beyond the time in which they said the plaintiffs agreed to erect it. Mr. Dodds (Messrs. W. J. S. & J. A. S. Scott) was for the plaintiffs and Mr. E. J. Meynell for the defendants.

Mr. Meynell, proceeding with the counterclaim set up by the defendants, said that Messrs. Crossley Brothers, through Mr. Ellis, their agent, sold a gas engine to Messrs. John Murdie & Co., to be used in crushing grain, in substitution for a steam engine which they had. The price of the engine was to be £200, and it was agreed that it was to be erected in four days after the plaintiffs got possession of the defendants' place. That agreement was noted on the tender by Mr. Ellis. The steam engine was removed and the plaintiffs got possession of the place on March 22. The gas engine should have been erected on March 25, but by that time they had just put down the cement. Messrs. Murdie were willing to give Messrs. Crossley a little longer time and made no claim till April 3, but the engine was not completed till April 19. The defendants had to cart their grain to another place to be crushed and to cart it back again, and the cost of this they put down at £19 9s. They deducted that amount from the bill and that was now the amount of the counterclaim.

John Murdie, the defendant, said he claimed from April 3 to April 19, during which the grain had to be carted to another mill to be crushed. He gave particulars of his interviews with Mr. Ellis, the plaintiffs' manager.

Cross-examined: Mr. Ellis undertook to include the laying of the foundation in the price and said he would have to employ a builder, but he did not say he could not say what time it would take to lay the foundation. He did not understand that the four days were not to include the laying of the foundations.

Mr. Dodds, for the plaintiff, in defense of the counterclaim, admitted that there was a contract to fix the machine within a certain time. An arrangement was made that intimation should be sent to Messrs. Crossley when the place was ready, in order that the men should be able to proceed with their work. Such intimation was never sent, but, on the contrary, Messrs. Crossley called at the defendants' place of business. At last a time was fixed and men were reserved for that time, but when the foreman went down to the defendants' yard for the purpose of seeing that everything was clean, he had to return and send his men to other jobs because the defendants' place was not ready. The job was done piecemeal as the result of the work being stopped, and the job had proved a dead loss to the plaintiffs.

Richard Ellis, for the plaintiffs, gave evidence, and said the machine was on the ground a week before it was required. The erection of the engine was delayed because of obstacles in the defendants' place. The foreman and workmen testified to the same effect.

Mr. Dodds, for the plaintiffs, said that even if there had been a technical breach, it was excused by the defendants' failure to clear their premises. He asked that the counterclaim should be dismissed with costs.

His honor gave judgment for the plaintiffs for £19 9s., the balance of the price of the engine, and said the defendants had not satisfied him that they did what lay in them to have the place clear. Therefore he dismissed the counterclaim, giving the plaintiffs costs on both.

FUEL.

The following gives the prices of gas per 1,000 cubic feet, in the northern towns of England: Newcastle and Gateshead, 2s. (49 cents), less 10 per cent discount; North Shields, 2s. 3d. (55 cents), less 5 to 20 per cent, according to consumption; South Shields, 3s. 2d. (77 cents), less 7½ to 20 per cent discount; Sunderland, 2s. 6d. (61 cents), less discounts; Hexham, 3s. 4d. (81 cents), less 10 to 20 per cent discount;

Alnwick, 3s. 10d. (93 cents), less 2½ per cent for over 30,000 feet; Carlisle, 2s. 3d. (55 cents); Hartlepool, 2s. 9d. (67 cents), less 10 per cent discount; Darlington, 3s. (73 cents), less 6d. (12 cents).

The present price of imported petroleum, used in oil engines, is 7½d. (15 cents) per gallon, in barrels of 40 to 42 gallons. Russian kerosene is 7¼d. (14½ cents) per gallon.

In this great coal center, prices are exceptionally high at present. The coal ordinarily used for steam boilers is "small," present price, 13s. ($3.16); mixed with "duff" or "waste," about 5s. ($1.22) per ton of 2,240 pounds.

TRANSPORTATION AND FREIGHT RATES.

The rate of freight for machinery per ton by the Wilson Line (sailing every three weeks), from New York to Newcastle direct, is 22s. 6d. ($5.48) and 5 per cent per ton, comparing favorably with the railroad freight from Manchester to Newcastle of 31s. 8d. ($7.71) and from Birmingham to Newcastle, 35s. ($8.59) per ton.

H. NIXON,
Vice and Deputy Consul.

NEWCASTLE, *August 26, 1900.*

NOTTINGHAM.

ENGINES IN USE.

Gas engines are in general and increasing use throughout this district, as throughout England. In fact, in the manufacture, perfecting, and use of gas engines, more progress has been shown than in almost any other similar line of development, and the leading manufacturers also produce excellent types of oil and gasoline engines. All the principal manufacturers, some 30 in number, maintain general offices in London, and are large exporters, one firm alone claiming to have 36,000 machines in operation. No American or foreign engines have ever been imported into this district or, so far as I can learn, into the island. The manufacture dates back many years, but the chief development for general power purposes has occurred within the last twenty-five, the invention of the Otto machine practically inaugurating the new era. The demand has very largely increased within recent years and is still increasing, and different types of engines for special purposes, from ¼ to 500 horsepower, have appeared in response to this demand, a local concern here now constructing one of 500 horsepower to order. The generally cheap price of gas for engine purposes has resulted in the use of this power for purposes and to an extent found, I believe, in no other country, but chiefly, of course, for electric lighting, pumping, sawing, printing, woodworking, and light manufacturing of all descriptions. Some large concerns have found it profitable to construct their own gas works, the cost of such gas naturally varying

according to the size of the works. As a basis of comparison, however, an excellent local engineering authority states that to drive a 100-horsepower engine, the cost of gas would be about 14 cents per hour exclusive of the wage of an unskilled attendant and interest on plant, the latter costing from £400 to £450 ($1,946.60 to $2,189.92), fixed. The same authority states that gasoline used in the average medium engine costs a trifle less than 1 cent per hour per horsepower. Giving an average estimate as to the cost of the usual type of gas engine, he states that an engine of ¼ horsepower will cost from $100 to $125; 5 horsepower, $400 to $450; 20 horsepower, about $1,250.

One of the best authorities (Mr. Hugh Campbell, of the Campbell Gas Engine Company, Limited, Halifax), replying courteously to inquiries, gave this interesting statement as to the English industry in general:

We beg to state that there is no market whatever for gasoline engines in this country. Any gasoline engines that are made are solely for export or for use in motor cars, and these not to a great extent. The reason for the want of popularity of the gasoline engine in Great Britain is the dangerous nature of the spirit required to be used in those engines, and this fact has been recognized by Parliament and a law is enforced which compels anyone using benzoline or gasoline to take out a license. The premises in which benzoline or gasoline is stored must be open to the inspection of the police at any time and without notice, and further, no larger quantity than 5 gallons can be stored at one time.

Gas engines have a very great demand in this country, both for home use and for export. Their popularity is increasing, and the sizes up to which these engines are made are increasing very rapidly. This is due to their economy in working and their ability to be used and worked by unskilled persons. The cost of fuel or of gas used varies in different parts of the country. Some gas companies or corporations make reductions in their charges for gas used for motive power or heating purposes, and in Plymouth and Sunderland and in one or two towns in Lancashire, gas can be had for these purposes as low as one-third per 1,000 cubic feet and upward. In such towns, the use of gas engines largely predominates, and engines of large powers are in constant demand. Gas engines are in demand up to 400-brake horsepower.

The oil engine is only of recent origin, say during the last ten years; that is to say, it only began to be a commercial success since that time. This engine uses heavy oil or petroleum, commonly known as kerosene in America. The cheaper grades of this oil are used and can be purchased in this country at prices varying from 4d. to 6d. per gallon, and for engines up to 20 horsepower, the economy in working is very much in advance of that of the steam engines of similar size. There is no danger in the use of heavy petroleum in these engines, and the insurance companies accept the risks without increase of premium. This fact alone will enable you to understand better than anything else the safety that there is in the use of the oil engines, as distinguished from that of the gasoline engines.

Clayton & Shuttleworth, Lincoln, through their general London agent, said:

We are not makers of gasoline engines. Our gas engines consume from 16 to 25 cubic feet of gas per indicated horsepower, or 21 to 33 cubic feet of gas per brake horsepower per hour. Our oil engines use about three-fourths of a pint of petroleum per brake horsepower per hour. The cost of both gas and oil, of course, varies greatly in different places.

I will not attempt to give a complete list of British manufacturers, but the following are best known, at least in this section: Crossley Bros., Limited, Manchester; Tangyes, Limited, Birmingham; Campbell Gas Engine Company, Limited, Halifax; Hornsby-Akroyd Company, Grantham; R. Cundall & Sons, Shipley; Andrew & Co., Limited, Reddish; John Taylor & Sons, Nottingham; National Gas Company, Ashton; Roby & Co., Lincoln; Premier Gas Company, Sandiacre; Clayton & Shuttleworth, Lincoln.

Nearly all of these concerns manufacture both gas and oil engines, and Tangyes, Hornsby-Ackroyd, and the Priestman Company, of Hull, also manufacture gasoline engines. The following random comparisons of published prices will be of interest to the general trade in the United States:

Campbell.—Horizontal engine, with water jacket, per brake horsepower: 1½, £35 ($170.32); 6, £71 ($345.52); 10, £93 ($452.58); 25, £189 ($919.76); 45, £334 ($1,625.40).

Clayton & Shuttleworth.—Exclusive of water vessel, foundation bolts, and packing, per brake horsepower: 1½, £48 ($233.59); 5, £78 ($379.58); 10, £106 ($515.84); 16, £125 ($608.31).

Andrew & Co.—For driving dynamos especially, fitted with two fly wheels, without water vessel, per brake horsepower: 2½, £52 ($253.05); 6½, £80 ($389.32); 10½, £105 ($510.98); 24, £158 ($768.90); 45, £290 ($1,411.28); 65, £400 ($1,946.60).

In this connection, I made request of the local agent for Crossley Brothers for their current price list. The request was referred to headquarters at Manchester. In their reply, they begged to say that "our business is to make and sell gas engines, and we do not think our giving the information asked for would be conducive to our interest."

Practically the only encouragement for American competition I have found is in the implication conveyed by this answer—that the largest firm in the world is afraid of its own price lists. In pursuing the subject, however, actual quotations with full specifications were obtained upon Crossley engines of 11, 20, and 33 horsepower. As these were quoted to an intending purchaser they are of special value, and the specifications for the 20 horsepower are given in full:

For 1 gas engine of 20-brake horsepower, as described below. Type.

DESCRIPTION.

Cylinder.—The cylinder is made with a water jacket, and is fitted with a loose liner of specially hard metal. When it is worn out it can be rebored, and, when necessary, renewed at a low cost.

Piston.—The piston is provided with at least four cast-iron rings of the best quality, which are easily renewable from time to time.

Connecting rod.—The connecting rod is of mild steel, turned bright and polished all over. Large phosphor-bronze adjustable bearings are provided at each end, and any wear can be easily taken up.

Bedplate.—The engine bedplate is a massive casting of strong section, planed on the under side in cases where it is mounted on a cast-iron foundation, and with a carefully-machined face where the cylinder is bolted on.

Crank shaft.—The crank shaft is made of mild forged steel, cut out of the solid, and machined and polished all over.

Bearings.—The bearings of the crank shaft are of great length and are made of phosphor-bronze or best gun metal, truly bored and fitted.

Side shaft.—The side shaft for working the various valves is of mild steel, turned and polished all over.

Valves.—All the valves are carefully turned, and ground true to their seats.

Side-shaft wheels.—The wheels driving the side shaft are made of cast iron with spiral teeth; in the larger electric-light engines, they are machine cut.

Governor.—The engine is fitted with an efficient high-speed governor, by means of which the speed can be adjusted at pleasure, and which automatically regulates the consumption of gas in proportion to the load on the engine.

Ignition valve.—All engines above 3 (nominal) horsepower are fitted with a timed ignition valve, which insures economical working under varying conditions and prevents waste of gas.

Safety gear.—All engines above 3 horsepower are fitted with a patent safety gear, which prevents them from turning the wrong way round at starting.

Ignition tubes.—These are of porcelain; they are quickly heated, very durable, and extremely cheap.

Gas bag.—A gas bag with rubber face and cast iron protecting cover is provided with each engine, and when working with coal gas it is fitted with a patent anti-fluctuator, which prevents the engine affecting the neighboring lights when at work.

Lubricators.—Efficient lubricators are fitted to all bearings and parts requiring oil. The cylinder is lubricated by an automatic drip lubricator worked from the side shaft.

Fly wheel.—One heavy cast-iron fly wheel, 5 feet 6 inches diameter by 7 inches wide, accurately bored and secured to the shaft by steel keys; turned on face, edges of rim, and boss.

Pulley.—A pulley 36 inches diameter by 12 inches wide, which can be fixed on either end of the shaft and is wide enough to suit fast and loose pulleys on the main shaft.

Silencers.—From 12 (nominal) horsepower and upward, all engines are provided with silencers for the exhaust, and all have either exhaust boxes or air boxes, as may be necessary, according to their size.

Spare parts.—One complete set of springs, 1 piston ring, 1 complete set of spanners, 1 grinding handle, 1 asbestus packing for the chimney, 3 porcelain ignition tubes, 24 asbestus washers for seating the tubes.

Painting.—The engine is carefully rubbed down and stopped, and painted three coats of best oil color, and afterwards carefully varnished.

Material.—The materials and workmanship throughout are of the very highest class of their respective kinds.

Water tank.—Three water circulating tanks made of galvanized iron of standard size.

Power.—Safe working load 20-brake horsepower when working with coal gas.

Speed.—One hundred and eighty revolutions per minute.

Test.—The engine to be tested before leaving the works and to be made to give off the above-mentioned powers.

Guaranty.—We undertake to repair or replace any parts of our engines which may be broken or which may suffer from undue wear within six months after date of delivery, unless such wear or breakage is caused by careless or improper treatment, and on the understanding that oil supplied or approved by us has been used.

Price.—For the sum of £123 net ($598.58), on rails at Manchester.

A quotation of £152 ($739.70) was made upon two 11-brake horsepower engines and of £172 ($837.03) for one 33-brake horsepower engine, with similar specifications, net on rails at Manchester.

In response to request by a business concern here for price and specifications upon a similar machine, viz, 20-brake horsepower, Tangyes Limited, replied that their nearest size "is our 18-brake horsepower suitable for this load as a constant and capable of working up to 20½-brake horsepower as a maximum," and furnished the following specifications:

For 18-brake horsepower new gas engine.

One new gas engine, "Otto" principle, Pinkney's patents, capable of developing 18-brake horsepower in regular work, and tested at our works to a maximum of 20½-brake horsepower (equal to 24 indicated horsepower), at a speed of 195 revolutions per minute.

General design and construction.—This engine is of the most recent construction, with all the latest improvements. The general design gives great strength and rigidity, good general appearance, and extreme simplicity of working parts.

The patent combustion chamber and valves are arranged to prevent severe shock and overheating and to insure positive ignition, with regular and steady burning of the gaseous charge during the power stroke.

The cylinder jacket, combustion chamber, and exhaust-valve box are cast together, avoiding troublesome face joints and leaking water passages.

The cylinder is fitted with loose self-sealing liner, which, when required, can be safely rebored, or readily renewed without sending cylinder to the works.

The liner and piston are of improved construction, and made of a specially hard metal.

A special sensitive governor is provided, of the incline type, giving great economy under all conditions of working, having automatic adjustment for varying loads, and variation by hand for different speeds while in motion.

The ignition tube is of porcelain, with special furnace for quickly heating same. It is very reliable, easy to manage, durable, and cheaply replaced.

Lubricator is provided for cylinder, worked by positive cam action.

The crank shaft is of best selected steel, carefully bent to shape.

The connecting rod is of hammered iron, fitted with adjustable brasses at either end, which can readily be renewed.

The engine is fitted with one fly wheel, 62 inches diameter by 7 inches face, turned on face, rim, and boss, and turned cast-iron driving pulley 27 inches diameter by 15 inches face.

Accessories provided are cast-iron exhaust silencer, cast-iron cased antifluctuator gas bag, constructed to deal effectually with varying pressures in mains, two galvanized-steel tanks for cooling water, and a set of spanners.

Spares.—We include one spare piston ring, one spring of each size used on the engine, three spare ignition tubes, a few asbestus linings, and a few asbestus washers for ends of tubes.

Present price, £110 ($535.32).

Delivered free rail Nottingham.

Delivery f. o. b. any railway station in Great Britain. Packing extra.

Terms.—Cash by 10th of month following date of invoice, less 2½ per cent.

The most recent development of note in the general trade is the announcement that the Westinghouse Company, or the British incorporation under that name, has purchased a large tract of land on the Manchester ship canal, with the intention of erecting works for turning out the Westinghouse high-speed (American) engines.

Investigation in regard to gasoline fully corroborates the statement of Mr. Campbell, heretofore quoted. As illustrating its almost utter exclusion, three different large wholesale houses of this city, handling oils, would make no quotation whatever, stating, however, that if they knew the character of engine for which it was intended, they could procure it, and explaining that it was kept only in small quantities and under severe regulations. From another house, I obtained a quotation of 1s. 10d. (44 cents) per gallon, put up in four-gallon tins, as limited by law, providing 32 gallons were purchased. This, I ascertained, would have to be specially ordered, and when asked to state their source of supply, the firm replied, "The Anglo-American Oil Company, Birkenhead or Liverpool." Comment seems superfluous.

A good quality of petroleum oil (kerosene), such as is in common use for engine purposes, was quoted by three different firms at 7¼d., 7½d., and 8d. (14½, 15, and 16 cents) per gallon in barrel lots of 42 or 43 gallons.

The present price for gas in Nottingham for power purposes is 2s. 4d. (56 cents) per 1,000 cubic feet for any quantity. Prior to April 1 last, it was 2s. (48 cents), the increase being due to the enhanced price of coal. The corporation owns and operates its own gas plant, the capital invested now being just a trifle under £1,050,000 ($5,109,825) and it will be of interest to state that no difference is made in the price for lighting, cooking, and heating purposes, the rate varying from 2s. 10d. (68 cents) for a consumption under 75,000 cubic feet per quarter to 2s. 6d. (60 cents) for 300,000 cubic feet and under 1,000,000 per quarter.

The cost of coal at present prices has added stimulus to the prevailing demand for gas and oil engines, while it of course affects the price of gas somewhat variably, according to locality. This district is a large producer and exporter of bituminous coal, and the following comparison of current prices with those of 1899 will disclose at a glance the seriousness of the question to all users for power purposes. The figures, reduced to American money, were furnished by Manager Henry Fisher, of the Clifton colliery, and correspond closely to those obtained from other sources. The quotations are for coal loaded on track at the colliery, which is just in the edge of Nottingham:

Description.	Prices.	
	September, 1899.	Present price.
Poorest quality of steam coal, or slack, used generally in steam boilers—"Smitham"	*Per ton.* $1.33	*Per ton.* $2.19
Fair average quality of steam coal—"screened nuts"	1.46	3.16
Best quality steam coal used for stationary engines—"Screened cobbles"	1.58	3.16
Average quality steam coal used by steam railroads for engine purposes—"locomotive steam coal"	1.94	3.65
Common household coal, used by poorer classes	1.64	2.92
Best household coal	2.67	4.07

TRANSPORTATION AND FREIGHT CHARGES.

Freight rates can hardly be quoted without knowing the character and weight of shipment and its destination inland, but these, either by fast or slow freight and including inland haul here, can easily be ascertained from any transportation company on the other side.

OUTLOOK FOR AMERICAN ENGINES.

For America to compete in England in the sale of gas and oil engines, would require the laying down here of machines as good as those made locally, and at a cheaper price.

S. C. McFarland, *Consul.*

Nottingham, *October 20, 1900.*

PLYMOUTH.

ENGINES IN USE.

There are in use at the present time in Plymouth, Stonehouse, and Devonport, 260 gas engines. These engines are entirely of English manufacture, and are purchased from firms in London, Birmingham, Cheltham, Worcester, and Yeovil. The prices, of course, vary according to the size and power of the engine. The following statement gives a fair average price for several sizes of engines. These prices are for engines delivered free to any station in England, complete with governor, water vessel, gas bag, and silencer, as follows: Brake power, 1 man; weight of engine, 182 pounds; size in inches, 31 long, 18 wide, and 17 high; diameter of fly wheel, 15 inches; stroke, 4½ inches; cylinder bore, 2¼ inches; diameter of pulley, 3 inches; speed in revolutions per minute, 450; price, $38.

Brake power, one-half horse; weight of engine, 308 pounds; size over all in inches, 38 inches long, 20 wide, 22 high; diameter of fly wheel, 21 inches; stroke, 6 inches; cylinder bore, 3 inches; diameter of pulley, 6 inches; speed in revolutions per minute, 375; price, $73.

Brake power, 1 horse; weight of engine, 672 pounds; size over all in inches, 50 long, 24 wide, 32 high; diameter of fly wheel, 30 inches; stroke, 8 inches; cylinder bore, 4 inches; diameter of pulley, 11 inches; speed in revolutions per minute, 350; price, $112.

FUEL.

Gas is the cheapest fuel obtainable for these engines in this district, and is therefore most generally used. In Plymouth, gas is 64 cents per 1,000 cubic feet, and in Devonport, 72 cents. These prices are higher than they have been for many years past. Gasoline, kerosene, and crude oils are too expensive to compete with gas. Steam coal is $7.30 per ton.

TRANSPORTATION AND FREIGHT RATES.

Goods intended for Devon and Cornwall would have to be shipped to Bristol, London, or Southampton for transshipment by rail or sea to Plymouth, as none but passenger liners trade directly between this port and the United States. The freight rates from Bristol and Southampton to Plymouth by sea are very moderate, but the carriage by rail is exorbitant.

OUTLOOK FOR AMERICAN ENGINES.

As yet, no engines of foreign manufacture have been introduced into this district, and outside of the personal interviews I have from time to time secured with local merchants, manufacturers, and engineering firms, no effort has been made to place the merits of American engineering machinery before prospective buyers. As many American machines are sold in this market, I can see no reason why gas engines should not find a ready and profitable sale. The best woodworking machines in this city are of American manufacture, and handsome cars are arriving weekly from the States for use on the extensive new electric street lines. Why should not these machines and cars be driven by power generated by American engines? I shall esteem it not only a duty but a pleasure to furnish any American manufacturer with a list of dealers, if requested.

JOS. G. STEPHENS, *Consul.*

PLYMOUTH, *September 21, 1900.*

SHEFFIELD.

ENGINES IN USE.

Gas engines are in use in this district, and the demand for them is increasing, particularly where little power is required. The source of supply is chiefly Manchester and Stockport. None are imported.

FUEL.

All kinds of fuel are available. The prices of oils are as follows per gallon, net, at Liverpool, barrels free:

Description.	Price.		Description.	Price.	
	d.	*Cents.*		*d.*	*Cents.*
Royal Daylight	6½	13	Testefas	6⅝	12½
Jessamine	6⅝	12½	Lavender	6⅝	12½
White Rose	7¼	14	Petroleum spirit, ordinary	8⅞	17
Snowflake	7⅛	14	Deodorized	9	18
White Light	6⅝	12½	Benzine	10	20
Rocklight	6⅜	12½	Motor car	10	20

Gasoline (in cases) costs 13s. 6d. ($3.28) per case.

The price of coal for steam boilers is (according to quality) from 9s. 6d. to 19s. ($2.31 to $4.62) per ton.

TRANSPORTATION AND FREIGHT RATES.

Facilities are good for the transportation of machinery by vessel to Liverpool or Hull and thence by rail. Freight rates vary according to route and line, and can be arranged in New York with the agents of the carriers.

OUTLOOK FOR AMERICAN ENGINES.

Messrs. Winder Bros., Limited, Royds Works, Sheffield, are willing to become agents for the introduction and sale of American gas engines, and it is suggested that manufacturers in the United States communicate with these gentlemen.

FRANK M. CLARK,
Vice-Consul.

SHEFFIELD, *October 8, 1900.*

TUNSTALL.

ENGINES IN USE.

Gas engines are in general use in this consular district by earthenware manufacturers, printers, woodcutters, stone masons, bakers, and others. The prices range from £25 to £250 ($121.66 to $1,216.62). I am unable to learn of the manufacture of any gas engines in this district. The machines in use here are obtained from Manchester and Yorkshire.

FUEL.

The estimated cost of running a 9-horsepower engine, manufactured by the Campbell Gas Engine Company, Limited, of Halifax, Yorkshire, is 10s. ($2.43) for sixty hours, while an 18-horsepower engine by Crossley Brothers, of Manchester, costs 25 cents per hour.

TRANSPORTATION AND FREIGHT RATES.

The best method of transporting machinery from the United States to this district is through the port of Liverpool. The quotations for freight from seaport to destination here are useless. Better terms by one-half can be made in the United States.

WM. HARRISON BRADLEY,
Consul.

TUNSTALL, *October 18, 1900.*

AMERICA.

DOMINION OF CANADA.

BRITISH COLUMBIA.

ENGINES IN USE.[1]

There are only five gas engines on Vancouver Island. Of these, only one is in practical operation, that used in the office of the British Columbia Printing and Engraving Company. The others have not been in use for some time.

It is possible that if particular attention were given to the trade, gas engines might be more generally used in the cities of Victoria and Nanaimo, both of which have good gas plants and other industries, though there is comparatively little manufacturing done on the island, and consequently only a minimum need of motive power.

FUEL.

Regarding fuel for gas engines, gasoline is very little used here, and is not kept in stock by dealers. Kerosene is consumed in large quantities, prices ranging from $2.75 to $3 per case of 10 gallons. Coal is one of the staple productions of the island, and can be bought by large consumers or dealers at from $4 to $5 per ton. Wood is also abundant, and sells at $2.50 to $3 per cord in large quantities.

TRANSPORTATION AND FREIGHT RATES.

Facilities for transportation are good. Two daily steamers connect with United States ports on Puget Sound. Freight rates are reasonable. From Seattle to Victoria, transportation charges for engines are $2 to $2.50 per ton or 40 cubic feet measurement. Machinery sent from Eastern States, billed direct to Victoria, is landed at this port for the same figures at which it is laid down in Seattle. The rates from the East to Seattle and Victoria are identical.

ABRAHAM E. SMITH, *Consul.*

VICTORIA, *September 5, 1900.*

[1] Canadian tariff: On engines, 25 per cent; crude petroleum and gas oils, 2½ cents per gallon; coal oil, kerosene, etc., 5 cents per gallon; gas meters, 35 per cent; gas fixtures, 30 per cent. Tariff on British goods, under the preferential tariff, one-third less.

MANITOBA.

ENGINES IN USE.

Gas engines are extensively used in this district, and the demand is growing from year to year.

OUTLOOK FOR AMERICAN ENGINES.

Gas engines are imported almost entirely from the United States, principally from Beloit, Racine, Chicago, and St. Paul. A small number of engines are brought into this district that are manufactured in Ontario, and a few are made in Winnipeg, but Canadian-made machines are more expensive than the American, and, being of inferior quality, do not come into serious competition with them. From 400 to 500 American-made engines have been sold in the district by Winnipeg dealers, principally for use in grain elevators along the numerous railroad lines running out of this city. They range in size from 4 to 16 horsepower and in price, according to size, from $250 to $1,500 at retail.

Quite a number of engines of 1 and 2 horsepower are in use in small creameries throughout the district; these are principally Ontario made, and retail at from $75 to $175.

An attempt was made this year to introduce gas engines for running thrashing machines. Two carloads of 12 to 16 horsepower portable engines were imported from the United States for this purpose, and in the early part of the season, many orders were taken for them at prices ranging from $1,150 to $1,400, but the failure of the wheat crop compelled the cancellation of most of the orders, and few sales were actually made. The prospect is that, owing to the economy in fuel, water, and labor, resulting from the use of gas engines, they will come into almost universal use for thrashing purposes, as well as in all other industries where light power is required.

One gasoline fire engine was bought by the municipal government of Winnipeg as an experiment a year ago, and has proved satisfactory. Others will be purchased as the needs of the city may require.

FUEL.

Gasoline is generally used in running these engines, and is all imported from the United States. The Imperial Oil Company has a monopoly of the trade in all coal-oil products in this market. Gasoline sells at 25 cents per gallon in barrel lots, and kerosene at 20 to 26 cents per gallon.

Anthracite, bituminous, and lignite coals and wood are all used as fuel in the district. The better grades of coal are imported from the

United States, principally from Ohio and Pennsylvania. The cheaper grades of coal and the wood are produced in this district. The average prices of the different kinds of fuel in Winnipeg for the year are as follows:

Coal, per ton: Anthracite, American, $9.50; Canadian, $9; bituminous, American, $7; Canadian (Galt), $7.50; lignite (Souris coal), $4.

Wood, per cord: Poplar, $3; red pine, $4.50; tamarac, $5; oak, $5.50.

TRANSPORTATION AND FREIGHT RATES.

Facilities for transportation of machinery and other merchandise from the United States into this district are very good; several lines of railways running out of the district connect with all parts of the Union. Freight charges on machinery in car-load lots are about 62 cents per 100 from St. Paul, Minn., and about 70 cents from Chicago, Wisconsin, and Michigan points.

W. H. H. GRAHAM, *Consul.*

WINNIPEG, *August 18, 1900.*

NEW BRUNSWICK.

MONCTON.

ENGINES IN USE.

Two engines purchased in Toronto have just been set in operation here. I am told that they give perfect satisfaction, and from present prospects there will be considerable demand for such machines. The prices of engines of Canadian manufacture range from $170 for 1½ horsepower to $320 for 7 horsepower; larger and intermediate sizes in proportion. A few engines are imported from England and from the United States. I have been informed that the prices are somewhat higher than the Canadian.

OUTLOOK FOR AMERICAN ENGINES.

Any concern desiring to introduce gas engines here would do well to communicate with A. W. Cruise, manufacturers' agent, who is at present the only one handling gas engines in this consular district.

FUEL.

City gas can be had in most of the towns here at from $1 to $1.25 per 1,000 cubic feet for power purposes. Gasoline costs 40 cents, kerosene 20 cents, and crude oil 15 cents a gallon, if purchased by the barrel. Coal for steam power costs $2.90 a ton if bought in quantities of 10 tons or upward.

TRANSPORTATION AND FREIGHT RATES.

There are ample facilities for distribution, and the freight rates from Moncton to Boston, about 500 miles, are, first class, 54 cents; second class, 48 cents; third class, 37 cents; fourth class, 29 cents per 100 pounds.

GUSTAVE BEUTELSPACHER,
Commercial Agent.

MONCTON, *August 23, 1900.*

ST. JOHN.

ENGINES IN USE.

There are but two important cities in this district—St. John (50,000) and Fredericton (8,000). There are only two gas engines in use in this city (St. John), one English and the other American. Electric plants are in both cities, and hence electric motors are preferred and more generally used, the cost being about the same. In the country districts, where they have no electric plants, gasoline or naphtha engines are in general use.

The prevailing prices for gas engines are about 10 to 15 per cent lower than the American prices. The source of supply is mostly from Montreal, Toronto, and Galt.

OUTLOOK FOR AMERICAN ENGINES.

My opinion is, if American manufacturers can compete in prices with Canadian manufacturers, there is a probability of profitable business being done, and the only means I know of for introducing the same would be by personal effort.

FUEL.

Fuels available are gasoline, costing 24 cents; kerosene, 20 cents; crude oils, 20 cents per imperial gallon; coal, $2 to $3 per ton, and wood, $1 per cord.

TRANSPORTATION AND FREIGHT RATES.

Facilities for transportation of machinery from the United States are good, either by way of the International Steamship Company's line or Canadian Pacific Railroad. Freight rates from Boston are about 30 cents per 100 pounds.

IRA B. MYERS, *Consul.*

ST. JOHN, *August 9, 1900.*

WOODSTOCK.

ENGINES IN USE.

Gas engines are not in use in this district, and their introduction here would be an undertaking not easy to accomplish.

FUEL.

A great deal of mill wood, or slab wood, edgings, etc., for which there is but little market, is used as fuel. Kerosene oil, which is the only petroleum product brought in to any extent, costs, in car lots, 20 cents per gallon.

Water is used in many small establishments in the city, such as printing offices, etc., power being furnished by the public waterworks. Steam is used in the large mills, with wood for fuel entirely, coal being too expensive, costing about $6 per ton in car lots.

TRANSPORTATION AND FREIGHT RATES.

Transportation facilities from the United States are good, via railroad direct or from provincial seaports.

FRANK C. DENISON, *Consul.*

WOODSTOCK, *August 25, 1900.*

NOVA SCOTIA.

SYDNEY.

ENGINES IN USE.

Gas engines are not used in this portion of Nova Scotia at all. Close inquiry among the users of engines in this community has failed to show where one is used either for stationary or marine purposes. The cost of bituminous coal has been so low in Nova Scotia heretofore that no attention has been given to the use of motive power, the fuel for which was not furnished by coal.

OUTLOOK FOR AMERICAN ENGINES.

Now that the demand for coal has forced prices to the point they have reached here, the mines with their present production being unable to supply the demand, other motive power could profitably seek an introduction into this market.

Sydney is at present growing rapidly in population, and, without doubt, numerous small factories will be started here, where power in a limited capacity will be required. It would afford me pleasure to receive from builders of gas, oil, or other engines, catalogues and other

descriptive literature to which I could call attention. The customs duty on engines of the character referred to is 25 per cent ad valorem. As stated in previous reports on matters connected with the introduction of new inventions into this section of the country, the best results can be obtained by a competent person who with a sample can practically illustrate the working and capabilities of the invention.

FUEL.

The fuel available in this section is strictly and wholly bituminous coal, of which there have been and are at present unlimited quantities at low prices. Gasoline, kerosene, crude oils, or distillates have never been used here, with the exception of kerosene, for illuminating purposes, and that oil has never retailed here by the barrel at less than 22 cents per gallon, and now retails at 30 cents per gallon. Gasoline and naphtha are unknown quantities in this market, except the small amount used by plumbers for their soldering stoves. The prices of coal in this market at retail for domestic use, as issued by the Dominion Coal Company are as follows, per ton: Culm, or slack coal, $2; run of the mines, $2.40; screened coal, $2.65.

Probably, a reduction of these prices could be made for stated amounts for manufacturing purposes.

TRANSPORTATION AND FREIGHT RATES.

Freight rates I am unable to state with any degree of reliability. The modes of transportation, however, are numerous, both by steamer and sail vessels and by railroad. From Boston, shippers have the advantage of all-steamer transportation, via the Plant Line steamship, which leaves there Friday of each week, delivering passengers and freight here on the succeeding Monday morning. Sailing vessels are to be had in Boston and other United States ports, making frequent trips to Nova Scotia. Rail facilities are also to be had over the numerous lines from the United States which connect with this section of Nova Scotia, via the Intercolonial Railway of Canada.

GEORGE N. WEST, *Consul.*

SYDNEY, *August 21, 1900.*

ONTARIO.

LONDON.

ENGINES IN USE.

Gas engines are not extensively used in this part of Ontario. I find a few of the smaller patterns here in London, but I think the utility of gas as a motive power in the ordinary factory or establishment has

not been fully understood heretofore, though it is gradually coming into favor.

There are several factories in this Province, but as to the comparative worth of their engines, I am not informed.

I found one English-made engine here and a few Canadian and American engines. The American engine is on sale by E. Leonard & Sons, manufacturers of engines and boilers, at $325 for a 5½-horsepower. The Canadian engine is offered at $265 for a 4-horsepower, and at $275 to $300 for a 6-horsepower. I was unable to learn the price of the English engine.

FUEL.

In this city, the best bituminous and anthracite coal is selling for $6 per ton; steam coal, $3.65; slack, $2.60 to $2.80, and ordinary lump at $4.25.

Other fuels are: Gasoline, 17 cents per gallon, retail; ordinary kerosene, 14½ to 15 cents per gallon; crude oil, $1.57 per barrel at lake ports; gas at $1 per thousand.

OUTLOOK FOR AMERICAN ENGINES.

I have talked with a number of factory men who are anxious to employ the gas engine in connection with their establishments, and I see no reason why our engines should not be profitably handled in this market, especially if they show superior merit. I think they should be handled by United States agents or representatives. In all cases, where possible, a display should be made of the foreign article intended for introduction, especially where any particular points of excellence exist.

It should be borne in mind by our manufacturers that while they have a protective duty to overcome in reaching this market, the Canadian manufacturer has a serious problem to solve in the price of fuel.

HENRY S. CULVER, *Consul.*

LONDON, *August 21, 1900.*

NIAGARA FALLS.

ENGINES IN USE.

Owing to the high cost of both oil and gasoline in Canada and the cheap water power and electric power in this district, the opening for gasoline engines in this vicinity is a limited one. I only find four gas engines in use, although this is a busy manufacturing district. These are from 4 to 5 horsepower and range in price from $300 to $400 each. Two of them were purchased in Montreal and two in Buffalo.

In explanation of the limited use, it may be stated that water power on the Welland Canal has been sold as low as $10 a year per horsepower, and as a bonus, electric power has been given at the nominal sum of $2 a year per horsepower.

FUEL.

Oil costs 18 cents per gallon by the barrel and gasoline 17 cents per gallon. Coal is admitted free of duty and sells at practically the same rate as in the United States, varying from $3.25 per ton for bituminous to $5.25 per ton for anthracite. There is a limited amount of gas at Port Colborne, but it can not be considered as a factor for more than three or four years longer.

FREIGHT RATES.

Freight rates are low, owing to the Welland Canal and the large number of railroads centering at Niagara Falls.

HARLAN W. BRUSH, *Consul.*

NIAGARA FALLS, *September 18, 1900.*

SAULT STE. MARIE.

ENGINES IN USE.

There are no gas engines in use in this district, and I do not think that any could be placed at present or in the near future.

Water and electricity furnish practically all the power for this city and vicinity.

The principal power required for outlying districts is for saw and other wood-working mills, and they largely use the refuse of the mills for fuel.

GEO. W. SHOTTS,
Commercial Agent.

SAULT STE. MARIE, *August 17, 1900.*

PRINCE EDWARD ISLAND.

ENGINES IN USE.

I am able to find but three gas engines in use in this city—two by publishing houses and one by the city water works at the pumping station. I am confident, however, that others could be introduced and sold, as there are many branches of trade that could use them to advantage.

FUEL.

Nearly all kinds of fuel are available. Coal for steam purposes at the present time is selling for from $3 to $4 per ton; gasoline, at about 20 cents per gallon, and kerosene, at 18¼ cents.

DELMAR J. VAIL, *Consul.*

CHARLOTTETOWN, *October 24, 1900.*

QUEBEC.

COATICOOK.

ENGINES IN USE.

There is not a single gas engine in use in this consular district. All machinery is run by water, steam, or electricity. I occupy an inland consulate and it is quite limited in extent.

FREIGHT.

The freight rate on machinery by railroad is 1¼ cents per mile per 100 pounds, for less than carload lots.

FUEL.

There are no coal mines in this province. All the coal used here comes from Nova Scotia and the United States. Bituminous coal is worth about $6 per ton, delivered. There is no anthracite coal in Canada. Wood is plentiful at about $2 per cord. Kerosene is worth 18 cents, crude oil 30 cents, and gasoline 25 cents per gallon.

J. H. JOHNSON, *Consul.*

COATICOOK, *August 10, 1900.*

GASPÉ BASIN.

ENGINES IN USE.

Gas engines are not used in this consular district, nor can I see any possibility of their profitable introduction, as there are no factories here with the exception of lumber mills for the manufacture of rough lumber, such as deals, boards, and shingles.

FUEL.

The fuel available in this district is mostly wood and costs from $1.50 to $2 per cord. Coal suitable for steam boilers costs $3 per ton.

ALMAR F. DICKSON, *Consul.*

GASPÉ BASIN, *August 15, 1900.*

QUEBEC.

OUTLOOK FOR AMERICAN ENGINES.

There are several gas engines in use in this city—all of American manufacture. Those using gas engines say the power is cheaper than electricity. There are two electric plants here, both run by water. One party said he was running a 4-horsepower gas engine for about $40 per annum. This party, who is well posted on this subject, thought that gas engines could be more generally introduced with practical efforts—by means of instructions in regard to setting up the engines, lighting them, etc. The manufacturers should have agents in Quebec.

FUEL.

There is plenty of fuel here. Soft coal is delivered at $7 and hard coal at $5 per ton; gasoline is sold at 21½ cents, and kerosene at 18 cents per gallon.

WM. W. HENRY, *Consul.*

QUEBEC, *August 20, 1900.*

SHERBROOKE.

ENGINES IN USE.

Gas engines are not in use in this district, and there seems to be no demand for them.

FUEL.

Gasoline retails at 40 cents per gallon; wholesale price, 25 cents. Kerosene, American water white, is extensively used, and retails at 28 cents per gallon; wholesale, 18 cents.

Coal is now $4.65 per ton. The price ranges from $3.75 to $4.75 per ton; it is Cape Breton coal.

TRANSPORTATION AND FREIGHT RATES.

The facilities for transportation of machinery from the United States are of the best. There are several different lines of railway and the freight rates are low. The duty on machinery of this nature is 25 per cent.

PAUL LANG, *Consul.*

SHERBROOKE, *August 21, 1900.*

STANBRIDGE.

ENGINES IN USE.

The consular district of Stanbridge, embracing the counties of Missisquoi, Brome, and part of Iberville, is an agricultural country, by

reason of which the principal enterprises would naturally be creameries and cheese factories. The power generally used in these is either water or steam. The patrons of these factories are altogether farmers, who not only supply these factories with milk and cream, but also with wood for fuel. To substitute gas engines for the engines now employed would cause a serious loss to the farmers (i. e., in the matter of fuel supply), and it would be natural that they should not want something new which would diminish their incomes. In the town of Bedford, 3 miles distant, the manufacturers of gas engines may be able to introduce their product, for the reason that the water supply at this town can not always be relied upon, and very often, manufacturers have been obliged to use steam.

I would suggest that manufacturers of gas engines exhibit their machines at the different fairs which take place in each county in the Province of Quebec during the month of September of each year.

FUEL.

Fuels available in this consular district are: Wood, $2 to $3 per cord; coal (American), $5 to $6 per ton; gasoline, 30 cents per gallon; American oil, 35 cents; Canadian oil, 28 cents per gallon.

TRANSPORTATION.

There are splendid connections with all points in the United States by the Canadian Pacific, Grand Trunk, and Central Vermont railways.

Freight.—Rates to the New England States, 54 cents per 100 pounds, and to the Middle States, 61 cents.

FELIX S. S. JOHNSON,
Commercial Agent.

STANBRIDGE, *September 4, 1900.*

YUKON.

Gas engines are not used in this consular district. nor are they likely to be for some time to come. Wood is the principal fuel for steam boilers, although coal is coming into use. Cord wood, in logs, is worth $20 per cord; coal, $25 per ton, and coal oil, $1.25 per gallon. There are ample facilities for the transportation of machinery by rail and steamer from the United States to Dawson, freight being about $125 per ton from the Pacific coast.

J. C. MCCOOK, *Consul.*

DAWSON, *September 10, 1900.*

MEXICO.

ENGINES IN USE.

Gas engines are used extensively in the Republic of Mexico, especially in mining districts. The prices of the gas engines in this country are the same as in the United States, taking into consideration the rate of exchange, with freight and duties added. They run from $1,000 Mexican silver up. The source of supply is the United States, and they reach this country principally by rail, a few coming by water.

FUEL.

Where coal or wood are obtainable, steam engines are used; where those fuels are not obtainable, gas engines are to be found, as it is easier and cheaper to transport gasoline in cans than coal or wood over the mountains. There is a large and increasing trade in gasoline engines in this country.

Prices are as follows: Mexican currency, per gallon—gasoline, 47½ cents; kerosene, 68½ cents; crude oil, 42½ cents. These prices are for large lots, and are subject to change without notice. Coal in the City of Mexico costs from $18 to $22 Mexican silver per ton delivered.

TRANSPORTATION.

The facilities for transportation of machinery depend upon the district to which the machinery is consigned. It is necessary to transport machinery on mule back to many of the mining camps where gasoline engines are used, the distributing points being reached by different railways.

JAMES R. HARDY,
Vice and Deputy Consul-General.

CITY OF MEXICO, *August 29, 1900.*

Duties.—According to information supplied in many of the following reports, the duties on engines and oil fuels entering Mexico are as follows:

Gasoline engines, when imported complete, 1 cent per kilogram (2.2046 pounds); imported incomplete (in parts), 12 cents per kilogram; kerosene and gasoline, 40 cents per gallon. The fluctuation in the value of Mexican currency, in which duties are paid, renders any reduction into American equivalents of no permanent value. By estimating the Mexican dollar at 50 cents United States, and the Mexican cent at one-half cent United States, a close enough computation for general purposes will be reached.

NORTHERN MEXICO.

GAS ENGINES FOR IRRIGATING.

There are few apparently more inviting fields for the introduction and use of gas engines than the Republic of Mexico. The two chief reasons why this is true are, first, a scarcity of coal and a consequent high price for that fuel, and, second, the lack of sufficient water for the purposes of irrigation in places where the necessity for vegetable gardens and small farming is imperative.

As is well known, Mexico is not a coal-producing country. Almost every ton of that fuel consumed in the Republic is imported from the United States. On this account coal is high, the price being $5 a ton gold on board the cars delivered to the Mexican Central Railroad in this city. That is the price paid by railroads, smelting companies, manufacturers, etc. The retail price is $15 Mexican money per ton in this consular district (Ciudad Juarez), or $7.20 gold. This makes the operation of steam engines expensive, the more so the farther away the consumer is from the border or from the Gulf ports, because of freight rates. As a matter of economy, therefore, gas engines are used, or will be used, whenever and wherever possible. The Mexican Ore Company, operating mines in various sections of the State of Chihuahua, has introduced gas engines to hoist ore from the shafts. The largest mine in Chihuahua, and one of the largest silver producing mines in the world, uses gasoline engines instead of those run with coal and steam.

On the large cattle ranches of northern Mexico, the problem of securing sufficient water for the stock has been the most serious one with which cattlemen have had to contend. Ranches of from 100,000 to 500,000 acres of grazing land are often without a living stream of water for several months in the year. Windmills have been used in some places, especially on the smaller ranches, but the larger ranchmen are introducing gasoline engines at intervals, thus securing, without interruption and without awaiting the vagaries of the wind, all the water that is necessary. One of the most extensive ranches can be supplied with sufficient water by two or three engines, stationed at such intervals as to enable the cattle to get to the water without being compelled to travel long distances. One man can attend to all of them. Although they are not all supplied with gas engines, it is not improbable that almost every ranch in Northern Mexico will establish them, and thus secure protection to their stock in the dry months when many head, if unsupplied by artificial means, would perish.

In all the northern part of Mexico there is but slight annual rainfall. It is entirely insufficient for agricultural purposes. In a few valleys, there are perpetual streams flowing out of the mountains and supplying all the water necessary for irrigation. In many other places the

supply fails, and that, too, at critical times. Thus, a splendid field is offered for the introduction of gasoline pumping engines. In the Rio Grande Valley below Ciudad Juarez, there are 98,000 acres of naturally fertile soil. It is an alluvial deposit. Irrigated, it produces abundant crops of fruit, grain, grasses, and vegetables. For several years past, there has been no water in the Rio Grande River, with the exception of the extra-seasonal water coming down from the Colorado Mountains for a month or six weeks in May and June. Water for two months in the year is of little value to land that must be irrigated every month in the year to be productive. It is estimated that each of the 98,000 acres in this valley will produce easily $20 (gold) worth of fruit, grain or vegetables in a year. Gasoline pumping engines would obviate the lack of river water to a very great extent. The number of acres an engine would irrigate depends, of course, upon the capacity of the machine, and this and the cost would have to be considered. Constant lack of water for several years has ruined the farmers in the valley so that they are too poor to establish pumping plants, even on a small scale. But there is undoubtedly a good field for gas engines in Mexico for irrigating purposes, since throughout the northern section of the Republic, water for agriculture is as essential as water for drinking and other domestic purposes.

I am informed by Mr. T. J. Woodside, customs broker of the Mexican Central Railroad, that he handles a gasoline engine almost every day in the year. They are distributed throughout the Republic, and, I have no doubt, are put to more varied use farther south in the country than in this section. It is scarcely possible to give the statistics of importations of gas engines, for the reason that in the Mexican custom-house, and in the Mexican central customs office as well, they are classed as machines, and go to swell the total of machinery imported, without distinction as to class or kind. The chief sources of supply are Kansas City, St. Louis, Chicago, and Cincinnati. No machinery is imported at this place from Europe.

TRANSPORTATION.

Ciudad Juarez is often referred to as the gateway to Mexico. It is the terminus of the Mexican Central Railroad, which receives freight at this place from El Paso, and El Paso is in direct communication by various trunk lines with the large manufacturing centers of the United States.

CHARLES W. KINDRICK, *Consul.*

CIUDAD JUAREZ, *September 25, 1900.*

LA PAZ.

ENGINES IN USE.

One small 2-horsepower gas engine has been introduced into this district, by the Progreso Mining Company, as an experiment. It was bought of the Union Iron Works, of San Francisco, Cal., at a cost of $500 (gold).

This engine has been tested with gasoline of 74°, at a cost of 50 cents (Mexican silver) per gallon, as against steam power, at a cost for wood fuel of $10 (Mexican) per cord. The comparison manifested at once the immense difference in the saving by the gas engine—estimated at 50 per cent. In view of the results of this experiment, the company has decided to replace its present system with gas engines to the capacity of some 200 horsepower.

The only other concern in the district capable of using gas engines is the Boleo Copper Mining Company, of Santa Rosalia, which, although operating principally by electricity, could undoubtedly use to advantage several medium-sized gas engines, as the present cost of the coal supply is exceedingly high.

FREIGHT RATES.

Freight from San Francisco is easily obtainable at about $5 (gold) per ton, and by rail to Guaymas, from any part of the United States west of New York, at about $20.

FUEL.

The usual price of coal laid down here is from $20 to $25 per ton, in Mexican money.

JAS. VIOSCA, *Vice-Consul.*

LA PAZ, *August 29, 1900.*

MAZATLAN.

ENGINES IN USE.

There are no gas engines used here. The engines employed consume wood, this being the cheapest fuel obtainable here, as kerosene and gasoline are worth from 85 to 90 cents (Mexican) per gallon, wholesale. Unless kerosene and gasoline can be procured at a much less rate, or some other fuel at a very low price, the outlook for the use of gas engines here is not very encouraging.

TRANSPORTATION AND FREIGHT RATES.

The facilities for transportation from the United States to Mazatlan are excellent, five different lines of steamers calling here regularly.

The freight on machinery is about $6 (gold) per ton, but, if very heavy, a lower rate can be obtained.

G. A. KAISER,
Vice and Deputy Consul.

MAZATLAN, *August 18, 1900.*

MONTEREY.

ENGINES IN USE.

Gas engines are extensively used throughout this district, and the demand therefor is steadily increasing, the price varying and depending upon the demand and supply at any given time. A 5-horsepower engine costs in position about $800 (Mexican), and a 2½-horsepower engine about $500 (Mexican), while a 2,000-horsepower engine costs about $2,000 (Mexican). The engines in question are imported from the United States.

The prices and cost of running gas engines are approximately large. The establishment of an agency here, or in Mexico City, would, it is thought, diminish both, and tend to a much more universal and extensive use of gas engines in this country.

FUEL.

All kinds of fuel are available in this district; gasoline costs 50 cents per gallon; wood costs $3.50 or over per cord; and coal about $6.50 per ton.

PHILIP C. HANNA, *Consul-General.*

MONTEREY, *September 7, 1900.*

SALTILLO.

ENGINES IN USE.

Gas engines are not used in this vicinity.

FUELS.

Fuels available in this district are gasoline, kerosene, coal, and wood. Gasoline retails at about 65 cents (Mexican) per gallon; kerosene at from 65 cents to 85 cents (Mexican) per gallon; cost of coal is about the same as in the United States, but is little used in this vicinity; wood retails at from $4 to $5 (Mexican) per load, which is about one-half cord.

TRANSPORTATION AND FREIGHT RATES.

The Mexican National Railway furnishes direct transportation from the border (Laredo, Tex.) to Saltillo and other points in this consular district.

As this is an inland consulate, inquiries in regard to freight rates and customs duties should be directed to J. Archibald, customs agent, Nuevo Laredo, Mexico.

CHAS. BURR TOWLE, *Consul.*

SALTILLO, *August 11, 1900.*

SAN LUIS POTOSI.

ENGINES IN USE.

Gas engines have been in use in this consular district for the past two years, but on a very small scale, the total number of engines employed at the present time not being more than ten or twelve.

The supply is entirely from the United States, coming directly from the manufacturers to the local agents here, by rail, either via Laredo or El Paso, Tex. The price of the gas engine exceeds very much that of the steam engine; in fact, the cost of a gas engine of a given horsepower is more than that of a steam engine of the same power together with the boiler, and the cost of running it is twice as great as the steam, on account of the difference in the price of fuels.

Several of the gas engines that have been introduced here have not come up to the standard represented in respect to horsepower and economy, and have in some instances been replaced by steam engines and boilers.

FUEL.

The principal fuel used in this section in factories and other establishments where power is needed is wood, the price of which is 7 cents (Mexican) per arroba (25 pounds). The price of gasoline is 62 cents (Mexican) per gallon.

FREIGHT RATES.

The freight rate from any central point in the United States to San Luis Potosi is $1 (gold) per 100 pounds in carload lots and $1.35 per 100 pounds for anything less than a full car.

JOHN H. FARWELL,
Consular Agent.

SAN LUIS POTOSI, *August 18, 1900.*

CENTRAL AMERICA.

BRITISH HONDURAS.

There is not likely to be any demand for gas engines in this colony for some years. The only steam machinery now employed in this district is in the manufacture of ice and sugar, and there is no gas or electricity at all.

W. L. AVERY, *Consul.*

BELIZE, *August 22, 1900.*

COSTA RICA.

There is no gas in Costa Rica. I am told that a printing office here (San José) uses petroleum with which to run its presses, with satisfactory results, and I have seen one automobile which uses petroleum for motor power.

FUEL.

Very little gasoline, naphtha, or petroleum is imported. If imported via Limon, railroad freight to San José would be very heavy, and if via Punta Arenas, and overland in ox carts, the risk of loss by evaporation would be great.

Coal is not used by the people here as fuel, and is not sold in the open market, so no prices can be quoted.

DUTY.

Gasoline is not quoted in tariff rates. Naphtha, petroleum, and kerosene pay a duty of 11 cents (about 5 cents gold) per kilo. Naphtha, if imported for steam launches, pays 2 cents (less than 1 cent gold) per kilo. Kerosene retails in San José at from 50 cents to 55 cents (gold) per gallon.

JOHN C. CALDWELL, *Consul.*

SAN JOSÉ, *September 5, 1900.*

HONDURAS.

ENGINES IN USE.

There are no gas engines in this district or, to my knowledge, in any part of Honduras; nor do I see any possibility of their being profitably introduced.

FUEL.

Of fuels, wood is the only one to be obtained in this district, and of this there is an abundance, selling readily at about $3.60 United States currency per cord. Kerosene imported from the United States is the only oil used for lighting purposes. Gasoline, crude oils, and distillates are unknown in this district. There is no fuel suitable for steam boilers.

TRANSPORTATION AND FREIGHT RATES.

Transportation is readily obtained for all products and manufactures of the United States to this country, through New Orleans and Mobile, per steamers employed in the fruit trade, of which there are four lines, viz, United Fruit Company, Bluefields Steamship Company, Independent Steamship Company, and John B. Cefalu & Bro., of New Orleans. All have branch offices at Mobile.

DUTY.

Import duty on all agricultural and mining machines, with their accessories, is 1 cent per pound.

R. WOODVILLE, *Vice-Consul.*

UTILLA, *August 20, 1900.*

SALVADOR.

ENGINES IN USE.

There are no gas engines in use in this consular district; therefore no prices or sources of supply can be quoted. I believe that the only effective means by which they could be introduced here would be to send an experienced man, who can talk Spanish, to give practical demonstrations of the power and economy of such engines. It is well to state that both hand and water power are available here at comparatively small cost.

FUEL.

The abundance and cheapness of wood render it impossible to use imported fuels, on account of the cost. There is no sale for coal here; therefore no prices can be quoted.

TRANSPORTATION AND FREIGHT RATES.

The only routes by which machinery can be imported are by steamer from San Francisco, or from New York, via Panama. It is desirable that intending exporters should understand that if they wish to ascertain the rates of freight from the United States to San Salvador, they should inquire at the steamship company's offices (Pacific Mail) in San Francisco or New York, as all freights must be prepaid there, and the minor offices here can only quote export rates to the United States. Landing charges and railroad freight to the capital amount to about $1.25 (silver) per hundredweight. There are no import duties, with the exception of nominal charges for stamped paper, etc., on machinery. It is impossible to accurately estimate the cost of interior transportation by means of ox carts, as this depends entirely on the condition of the roads, the distance, and the season of the year.

JOHN JENKINS, *Consul.*

SAN SALVADOR, *September 12, 1900.*

WEST INDIES.

BAHAMAS.

ENGINES IN USE.

Gas such as is employed for lighting purposes in cities of the United States is not manufactured or used in this colony, and there are therefore, no gas engines in use. This motive power being lacking, I do not see any opportunity of introducing or selling gas engines.

The cost of manufacturing gas is too great—since all coal would have to be imported from the United States—to expect that it will ever be used here. There is far more likelihood that this city will soon be lighted by electricity.

FUEL.

As to fuels available in this colony, there are wood, bituminous coal, and kerosene. A very small quantity of gasoline is used, but it is not kept on sale, vessels declining to carry it. An attempt has been made, but with little success, to introduce acetylene. It does not seem to be popular here. Coal is imported in small quantities from the United States and is used mostly for steamship purposes. The average price of coal is about $7 or $8 per ton. Wood is worth $3 or $4 per cord.

A number of kerosene stoves of small size are used here, and are all imported from the United States.

The two large hotels owned by Mr. Henry M. Flagler use electric lights. The other people use kerosene and candles. The streets are lighted by oil lamps.

TRANSPORTATION AND FREIGHT RATES.

Facilities are excellent for the transportation of machinery from the United States, the rate of freight being about 50 cents per barrel measurement. Special rates could probably be obtained by proper negotiations. The communication is direct with New York, three steamers a month making trips to and from this port, and during a portion of the winter triweekly steamers ply between Florida and the Bahamas.

DUTY.

Steam, oil, and gas engines are on the free list for duties.

THOS. J. MCLAIN, *Consul.*

NASSAU, *October 10, 1900.*

HAITI.

ENGINES IN USE.

There are no gas engines used in this country, as far as I can learn.

FUEL.

Gasoline and kerosene are imported for lighting purposes, but no crude oils or distillates are imported. The average cost of coal here is from $12 to $15 per ton.

TRANSPORTATION AND FREIGHT RATES.

Facilities for the transportation of machinery from the United States are good, there being two lines of steamers plying fortnightly and one line running weekly. Freight rates are quoted at 12 cents per square foot, but on account of the competition, goods can be shipped at about half that rate.

ALEXANDER BATTISTE,
Consul-General.

PORT AU PRINCE, *August 23, 1900.*

BRAZIL.

ENGINES IN USE.

Comparatively few gas engines are in use in Brazil. The business is confined mostly to two or three manufacturers; one English; one the "Otto," German; and one the "Nash," American. The engines of the "Otto" type are 300 horsepower, those of the English type about 100 horsepower, and the American types average approximately 50 horsepower.

In Brazil, there are only nine cities which can use gas engines, viz: Manaos, Para, Pernambuco, Bahia, Rio de Janeiro, Sao Paulo, Santos, Porto Alegre, and Rio Grande do Sul. The manufacturing industries of those districts are either conducted on a very large scale—such as cotton goods and sugar refineries, or on a small scale, such as printing offices, boot and shoe factories, hat factories, etc.

FUELS.

Fuels available are imported coal and kerosene. Crude oils are not imported, owing to the almost prohibitive tariffs. Gasoline is imported in small quantities only, and is very expensive; besides, its explosive nature makes it dangerous in the hands of the native engineers.

Gas here is expensive, $3 per 1,000 cubic feet, as all coal until recently has been imported from England, at all prices from 29s. to 50s. ($7.06 to $12.16) per ton, according to the packet rates from the home ports. Happily, the importation of American coal has commenced, as Messrs. Large Irmaos, of Rio, are not only using Pocahontas coal on their own 20 steamers, but are selling in round lots to foreign vessels which enter the port.

Sao Paulo, with 220,000 inhabitants, and Rio, with a population of 700,000, have for several years been working on the problem of public lighting from water power, of which there is abundance in this country at certain times of year. The Sao Paulo Tramway Light and Power Company, a Canadian-American concern, has nearly completed a large dam on the Paranhiba River, which will transmit about 18,000 horsepower to the city of Sao Paulo, and thence to Santos—a distance of 25 miles to the former and 75 miles to the latter. The company controls franchises which will give it the exclusive right to sell light and power in those two cities, with the exception of 1,000,000 cubic feet of gas, for which the Sao Paulo Gas Company has a contract with the city for some years to come. The light problem at Rio is being studied by competent engineers, but no definite plan has been evolved. There is an abundance of water power within a radius of 100 miles, and at present promoters are working on the enterprise.

DUTY.

It is stated by the most prominent American importing house in Rio that the duties and dispatching expenses at the custom-house here will average over 30 per cent of the net value of the machine, with 5 to 8 per cent additional for freight, and that, although the managers have put in some of the best plants here for electric lighting and ventilating purposes, they do not care to carry the engines in stock.

TRANSPORTATION AND FREIGHT RATES.

The transportation of machinery from the United States to Brazil—at least to the ports south of Para—is effected on three steamship lines, viz: Lamport & Holt, Prince, and Sloman.

Freight rates from the United States are exorbitant, $13.20 per ton of 40 cubic feet, while quotations for Belgium and England are 50 per cent less.

W. L. Lowrie, *Vice Consul-General.*

Rio de Janeiro, *October 16, 1900.*

PERNAMBUCO.

ENGINES IN USE.

There are about 10 gas engines in use in this district. The prices paid are as follows: One-horsepower, £20 ($97.33); 2-horsepower, £25 ($121.66); 4-horsepower, £50 ($243.33); 6-horsepower, £60 ($291.99); 10-horsepower, £90 ($437.99). They are all English and German machines.

There is no reason why American gas engines should not supply a part of the demand here, which, though small at present, might be very much increased by the visit of an active American representative.

FUEL.

Gasoline is little used here, and has no fixed price. Kerosene is plentiful, and costs at present 11 milreis ($2.30) per case of 10 gallons. Crude oils and distillates are not used here. Coal costs at present about $15 per ton.

TRANSPORTATION AND FREIGHT RATES.

There are three regular lines of steamers plying from New York to this port, besides tramp steamers and sailing vessels. The freight rates from the United States to Pernambuco can be more accurately obtained in New York than here.

EDWIN N. GUNSAULUS, *Consul.*

PERNAMBUCO, *October 11, 1900.*

BRITISH GUIANA.

ENGINES IN USE.

Only 1 gas engine is in use in this colony. It is a 1½-horsepower affair imported from Samuel Baker & Sons, London, and cost $336. It is used in a soda-water factory. It costs $6 per month to operate, with gas at $2.80 per 1,000 feet. There are so few minor industries here that it is doubtful if more than two or three such engines could be used in the entire district.

FUELS.

The fuels at present available are: Wood, $2 per cord; oil, 50 cents per gallon, and coal, $7.50 to $8 per ton.

TRANSPORTATION.

The Quebec and the Armstrong steamship companies, with headquarters in New York, conduct the transportation business with this port. Freight on machinery is about $5 per ton. Machinery is duty free.

GEO. H. MOULTON, *Consul.*

DEMERARA, *August 30, 1900.*

CHILE.

ENGINES IN USE.

Gas engines are in use to a considerable extent in Valparaiso, and also in Santiago, the capital. They are used for light work; in tobacco factories, as a motive power for cutting and preparing leaf tobacco for cigarettes; in all boot and shoe factories of importance; in the large factories of military clothing in both mentioned cities; in the smaller printing and lithographic establishments, and for wood working on a small scale. The use of petroleum and kerosene engines has been abandoned in favor of gas engines in all Chilean cities where coal gas is manufactured and sold at moderate prices. The use of gas engines has proved to be very profitable to small manufacturers. All gas engines are imported, none being made in Chile. The principal importers of the gas engines made in England are Rose, Innes & Co., and Don Guillermo Helfmann; the importers of the Otto engine made at Deutz, in Germany, are Saavedra, Benard & Co., all of Valparaiso. Price, quality, and build of both English and German machines are about equal. A 5-horsepower costs to-day $540, United States currency, discount 8 per cent prompt cash; the price including freight, insurance, shipping and landing charges, as well as profit or commission. Machine shops use 4 to 6 horsepower; wood workers, 3 to 4, and light works, 1 to 2 horsepower. If more than 8 horsepower is required, steam is preferred as being more economical. The Godiva engines (a few of which have been imported) are roughly finished, but are excellent engines. They are made by Payne & Bates, of Coventry, England. Their horizontal engines (the type most preferred in Chile) are made from ½ to 9 horsepower; the ½ horsepower runs at a speed of from 250 to 300 revolutions, and weighs 224 pounds. The price in England is £16 10s. ($80.29), with discount 20 per cent. The 9-horsepower runs at 180 revolutions, weighs 5,264 pounds, and costs in England £112 ($545.05), to which must be added freight and expenses. Messrs. Guillermo A. Rohde & Co., lithographers of Valparaiso, use a Deutz German Otto, of 3 horsepower, which runs nine and one-half hours per day, consuming in the six working days of the week, 300 to 350 cubic meters of gas at a cost of about $45 Chilean ($15 American) per month. It cost, landed in Valparaiso, 1,745 marks ($415.31). This was ordered direct, and consequently bears no profit.

Several good engines are imported from Leicester, England; one of these, of 8 horsepower, costs £100 ($486.65), subject to a discount of 20 per cent. The engine is running in the boot and shoe factory of Edwin J. Gibbs, of Valparaiso, and supplies 100 electric lights for the same factory in winter. Statistics do not give the number of gas engines imported, as the custom-house mixes up all engines not paying duties, and steam, petroleum, gasoline, gas, etc., come under one item.

OUTLOOK FOR AMERICAN ENGINES.

The conclusion to be drawn from actual and careful inquiry is that great numbers of gas engines are sold and used in Chile; that owing to competition, and the fact that the machines enter the country free of customs duty, they are sold very cheaply, and finally that the Otto system is the one most appreciated and salable, but there is a difference of opinion as to which is the best, the German Otto or the English-made Otto. I believe that if American manufacturers of this line of goods had active resident agents at Valparaiso and Santiago, they would soon establish an important and profitable trade in Chile.

FUEL.

Coal in large quantities is mined about 300 miles south of Valparaiso. It is of a brownish black color, is very dusty, and highly inflammable, often generating gases in the holds of sailing ships, but appears to be carried in safety in steamer bunkers. It is used on the State railroads for locomotives. The Chilean coal mines appear to be inexhaustible. There is no customs duty on imported coal. Chilean coal costs at present $23 Chilean currency ($7.80 American) per ton of 1,000 kilograms (2,204.6 pounds); Australian coal is sold at 33s. to 34s. 6d. ($8.05 to $8.39) per ton of 1,016 kilograms (2,240 pounds).

Gasoline is imported, but in very small quantities. Kerosene has been imported to a slight extent from the petroleum wells of northern Peru, but the importation from that source has ceased, and the United States supplies the total consumption of the country.

TRANSPORTATION AND FREIGHT RATES.

Two lines of steamers, the Merchants Line, of W. R. Grace & Co., and the West Coast Line, of Beeche & Co., sail at regular intervals between New York, Valparaiso, and the west coast of South America. The German Kosmos Line of steamers run between San Francisco and Europe, calling at the principal ports on this west coast. In a short time, the Pacific Steam Navigation Company (British) and the Compania Sud-Americana de Vapores (Chilean) will extend their coast line of steamers to San Francisco.

Occasionally, sailing ships are chartered in the United States to bring American products to Chile. There is for the present no lack of tonnage for the transportation of cargo between the United States and Chile, and taking into consideration the recent high price of coal, freights may be considered as reasonable, although not quite so low as they are from Europe.

JOHN F. CAPLES, *Consul.*

VALPARAISO, *December 19, 1900.*

COLOMBIA.

BOCAS DEL TORO.

ENGINES IN USE.

Gas engines in small launches and tugs have proven to be peculiarly adapted to the business of Bocas del Toro, which consists almost exclusively in the export of bananas to the United States.

The municipal district of Bocas del Toro comprises Chiriqui Lagoon, 36 miles long and 12 miles wide, and Almirante Bay and adjoining bays and lagoons very nearly as extensive.

There is not a road of any kind in the district except within the limits of a single plantation, and horses and wheeled vehicles are not used. All transportation and travel is done by boat. Consequently, all the plantations which produce the 2,000,000 bunches of bananas exported annually from this port are situated on the shore line of these bays and lagoons, or on the banks of the rivers flowing into them. These rivers, like most tropical rivers, have very shallow bars at the mouth. Only the lightest draft boats can go over these bars, even when the river is navigable for some miles, once inside the bar.

Bananas, being a very perishable commodity when once cut, must be handled very quickly and taken aboard the fruit ship and away to market in the shortest time possible. The custom in this port, and in most other banana ports as well, is to send lighters, or barges in the tow of launches or tugs to the different plantations, buying the fruit and bringing the barges together at central points where the fruit ships anchor, and the bananas are loaded from the barges to the ships. Ten or twelve years ago, this work was done with steam launches under great difficulties and with great irregularities. The town of Bocas del Toro has no fresh water, except what is caught in tanks and barrels from roofs. Launches were frequently, in fact generally, working continuously twenty-four to thirty hours out of reach of any fresh-water supply, and consequently used sea water in boilers, ruining these and causing accidents, breakdowns, and delays. Competent engineers and firemen were hard to get, and when to be had were very expensive. Coal had to be brought from the United States, and that also came high. Eight or nine years ago, a naphtha launch was brought on trial from an establishment at Morris Heights station, New York, and another from the Daimler Company, in Germany. Both gave fairly good satisfaction, except for the fact that there were no machine shops, and the few engineers that were here seemed to be unable to make repairs on gas engines; consequently, there were long and serious waits for broken parts to be replaced from the United States. As the banana business grew, two Wolverine motor boats were purchased, but for a couple of years the naphtha boats enjoyed the reputation of

being unreliable. Finally Mr. M. T. Snyder, a grower and shipper of bananas on a large scale and owner of two of these boats, brought down a man from the Wolverine factory, and he made the boats do such excellent service that that seemed to be the solution of the problem.

A first-class man, who had had years of experience in the Wolverine factories, was engaged at a first-class salary. The machine shops belonging to Mr. Snyder were enlarged and restocked under the supervision of this man, and to-day in Bocas del Toro, there are 27 gas-engine boats and 4 steam tugs. The gas-engine boats do excellent service and give excellent satisfaction. There are 21 Wolverine, 3 Daimler, and 2 Truscot moters.

Any inexperienced man with ordinary intelligence can run a gas engine, and consequently they cost very much less to run than steam. Several of the gas-engine boats are converted steam tugs. They do as good work as steamboats; there are no boilers to get out of order; no soot, smoke, grease, or coal dirt; no bulky load of dirty coal; no high-priced engineers and firemen; no grate bars or crown sheets to burn out, and instead of having to wait a couple of hours to make steam, a gas-engine boat can be started at full speed in from one to three minutes at any hour of the day or night.

I would add that one reason why there are so many Wolverine motors here and so few of other kinds, is that the shops are large, perfectly appointed, and especially adapted to supply parts of Wolverine motors and make repairs thereon. The master mechanic is a Wolverine motorman, and, moreover, the Wolverine motors are now well known, while another kind would be an experiment.

The Daimler motors seem to be good machines, but cost much more than the Wolverines.

The Wolverine motors are bought from the Wolverine factories direct or through commission houses.

FUEL.

There is no coal in this market. Anyone wishing it is compelled to import it.

Gasoline is imported by the fruit companies which have launches in 210-gallon drums.

TRANSPORTATION AND FREIGHT RATES.

From 10 to 20 ships per month come to Bocas del Toro from Mobile and New Orleans direct. Freight is $8 per ton.

DUTIES.

Import duty on machinery, etc., is 5 per cent (approximately) ad valorem.

D. R. Hand, *Consular Agent.*

Bocas del Toro, *November 29, 1900.*

BOGOTA.

Gas engines are not used in this consular district, and there is no possibility of there being any demand for them in the near future. As this reply is so positive to the initial inquiry, there can be no reason for furnishing the data mentioned in the circular. Gasoline, kerosene, crude oils, and distillates are not available here, and the high customs duties, enormous cost of transportation, exchange on New York, etc., make the price of these articles prohibitive of their use as fuel. There is a vast supply of very soft bituminous coal in Colombia, that sells for about $20 Colombian money ($9 gold) per ton.

A. M. Beaupré,
Consul-General.

Bogota, *October 25, 1900.*

ECUADOR.

ENGINES IN USE.

So far as I can learn, but one gas engine has ever been imported into this country, and this, I am told, is now for sale at one-third the original cost.

FUEL.

Fuel of all descriptions, excepting wood and crude petroleum, is imported in very limited quantities. Deposits of petroleum are found in the Santa Elena district on the coast, but the investigations made from time to time by various parties have resulted in nothing so far.

Perry M. de Leon,
Consul-General.

Guayaquil, *September 20, 1900.*

PARAGUAY.

ENGINES IN USE.

Gas engines are not in use in Paraguay. If gas engines can compete with the engines now in use here, a few might be sold, but to achieve this, a practical man should come here with an engine and show the business men and tradesmen that they could economize by its use. Catalogues are useless, for various reasons, and the only way to convince these people that they must improve their plants or make alterations is to have a good practical man work the machine in their presence. Every business man or tradesman expects to get credit, and it is necessary to have a thoroughly good agent to look after the creditor's interest before entering into business.

FUEL.

The fuel used for steam boilers is hard wood, it being very cheap, costing only $1 gold per cubic yard.

Kerosene is used for lighting, and costs $2 gold per case of two cans (about 10 gallons).

Crude oils are selling for from 50 cents to 60 cents gold per kilogram (2.2046 pounds). Distillates cost about double these prices.

Gasoline is not known here.

Coal is not used. Some time ago, the firm of Señors Manzoni Hermanos imported a small shipment for trial, but it could not compete with the price of firewood and they had to give up the business.

TRANSPORTATION—FREIGHT RATES.

The transportation of machinery and all other merchandise from Montevideo and Buenos Ayres to this city is by river steamers. Freight from Montevideo is $4 gold, and from Buenos Ayres $3 gold, per ton of 1,000 kilograms, or 40 cubic feet. For heavy pieces of machinery, the rate is conventional.

DUTY.

All machinery comes into this country free of customs duties.

WILLIAM HARRISON,
Vice-Consul.

ASUNCION, *September 26, 1900.*

URUGUAY.

ENGINES IN USE.

In Montevideo, from 30 to 40 gas engines are in use, none exceeding 10 horsepower. These engines are all of German and English manufacture.

OUTLOOK FOR AMERICAN ENGINES.

No effort has been made to introduce American engines, save by catalogues printed in English.

I am of opinion that the best type of American gas engine can find a footing in Uruguay, notwithstanding the fact that gas sells at $3.50 per 1,000 feet for lighting purposes, with a reasonable reduction for power purposes in the daytime.

FUELS.

No natural fuels are available in Uruguay; there is no coal, and wood is not found either in quantity or quality fit for steam making.

Gasoline is not known in the market as a power maker, nor can it be procured even in a small way. Kerosene from the United States is here in ample supply, and costs an average of $3.75 per case of two 5-gallon tins. The coal used for steam purposes comes wholly from England and never costs less than $7.50 per long ton, but is now sold at about double that rate, owing to the coal troubles in England. But little American coal has been used here recently, although it stood the local River Plate ports tests well.[1]

TRANSPORTATION AND FREIGHT RATES.

Transportation facilities from the United States are now very good, but slow. It takes an average of thirty days from New York to the River Plate ports, at rates in excess of those that are at the acceptance of German, French, Italian, or English competitors in this or any other line. Shippers have easy ways of knowing the rates at New York; the foreign rate is always lower, and the time from ten to four days faster. Freight has been delivered here seventeen days out from Genoa, at $2.10 per ton less than from New York, at twenty-six to thirty days time en voyage.

DUTY.

The duty on gas engines is 10 per cent ad valorem.

ALBERT W. SWALM, *Consul.*

MONTEVIDEO, *October 16, 1900.*

PAYSANDU.

ENGINES IN USE.

No gas engines are used here in this district, and any effort to introduce them would be a complete failure.

FUELS.

The fuels available in this country are wood and coal; the latter is imported from Europe, its present price being $16 per ton. Kerosene oil is the general article for street and indoor lighting; its present price is $2.75 per case of 10 gallons. Import duty, in bond, is $1.65 per case. Other inflammables, as gasoline, crude oils, etc., are not used.

TRANSPORTATION AND FREIGHT RATES.

Transportation of machinery from the United States can be effected by either sailboats or steamers, there being two splendid wharves here

[1] NOTE BY BUREAU OF FOREIGN COMMERCE.—As yet, transportation rates to River Plate countries have prevented regular shipments of American coal.

where seagoing vessels discharge their cargoes. One of the wharves belongs to the Uruguay Midland Railroad Company, and the other to Messrs. Hufnagel, Plottier & Co., importers and exporters. Freight from the United States to Paysandu, is $8.50 to $9 per ton and 10 per cent primage.

JOHN G. HUFNAGEL,
Commercial Agent.

PAYSANDU, *September 24, 1900.*

VENEZUELA.

Vice-Consul Volkmar writes, under date of September 18, 1900, that owing to the absence of gas works in Puerto Cabello, there can be no possible opening for the sale of gas engines there.

ASIA.

BRITISH INDIA.

BOMBAY.

ENGINES IN USE.[1]

After careful investigation, I find that there is a very limited number of gas (coal gas) engines in use in India. In the first place, there are only two or three cities in all India that have gas. In these, the price of gas is so expensive that the use of gas engines is not possible, if economy is made a question. The price of coal gas in the city of Bombay is 6 rupees ($1.95) per 1,000 cubic feet, and the result is that there are only 10 or 12 (coal) gas engines in use in this city, and I might say in all western India, as I believe Bombay is the only city on the western side of the peninsula that manufactures coal gas. The oil (gas) engine is in very common use in this part of India. I should estimate that there are 400 oil engines employed in the city of Bombay. I have no means of knowing how many are in use in other parts of this district. They are called simply "oil engines," and the motive power used is vaporized kerosene oil.

There are several different kinds of oil engines, all English make, but the one mostly in use is the "Rocket oil engine." This is made by Stevenson & Co., Newcastle-on-Tyne, and delivered f. o. b. at that port at prices ranging from £120 ($583.98) for 2 nominal horsepower to £335 ($1,630.28) for a 20 nominal horsepower engine. These prices include all necessary tools, oil cans, and spares.

OUTLOOK FOR AMERICAN ENGINES.

The American oil engine is a better and more simply constructed machine than the English, and that is what the trade here demands. Less expensive, it should meet with favor, provided the question of freight rates does not stand in the way of our successful competition for a fair share of the trade of India.

FUEL.

In regard to fuels, permit me to say that gasoline is not in use in this country. I understand that its use as a fuel is prohibited in this city.

[1] Machinery enters British India duty free.

The oils or kerosene used are American and Russian. The Russian is the least expensive, but is inferior to the American. The prices at retail in tin cases containing 10 gallons are as follows:

Manufacture.	Brand.	Test.	Cents per gallon.
		°	
American	"Snowflake"	150	$19\frac{7}{10}$
Do	"Tiger"	125	$12\frac{1}{2}$
Russian		125	$12\frac{1}{2}$

In reference to the quality and cost of coal and other fuel in use at this port, I would refer to my report to the Department of State on coal, dated May 3, 1900.[1]

TRANSPORTATION AND FREIGHT RATES.

Transportation facilities from the United States to India are of the best; water all the way. From New York to Bombay by sailing ships via Cape Town, the time is about four months. By steamer through the Suez Canal from Bombay to New York via England, the rates are listed at 40s. ($9.73) per ton. This is in British bottoms, which naturally discriminate in favor of England. The distance to Liverpool is about two-thirds of the way to New York, yet the freight rates to Liverpool are never more than one-half (and frequently still less) what they are by the same steamer to New York. The spacious deep-water harbor and the splendid dock and wharf facilities at Bombay, together with the systems of railways that converge at this port, justly make it the "Gateway of India."

While the American manufacturers can produce cheaper and better than those of any other nation, yet they labor under the great disadvantage of not owning a sufficient merchant marine, and the question of competition is often solved, not by the cost of production or quality, but by the cheapness of freight rates.

WILLIAM T. FEE, *Consul.*

BOMBAY, INDIA, *September 14, 1900.*

CALCUTTA.

ENGINES IN USE.

There are but few gas engines in use in India. The only ones employed in Calcutta are at the army clothing department, a government manufactory.

Oil engines are in common use and are thought to have advantages over the gas engine, especially as they are independent of the gas mains and can be used in any place.

[1] Special Consular Reports, Foreign Markets for American Coal, Vol. XXI, Part I, page 278.

OUTLOOK FOR AMERICAN ENGINES.

If gas engines were introduced here, they might supersede the oil engines, as they have in other places. The best way to introduce them would probably be to send a competent man here with an engine, to show its superiority over others.

FUEL.

Coal is abundant and is the principal fuel used here. The first quality, such as is employed on steamships and in furnaces, is sold, delivered at the railway terminus in Calcutta, at from $2.12 to $2.24 per ton.

Oil engines are run with kerosene, cocoanut, and mustard oils, which are cheap here. Gas costs $1.60 per 1,000 cubic feet.

TRANSPORTATION AND FREIGHT RATES.

There is a direct line of steamships, the Bucknall Line, running between New York and Calcutta, and the freight rate on machinery is about $10 per ton of 40 cubic feet.

R. F. PATTERSON,
Consul-General.

CALCUTTA, *September 18, 1900.*

CEYLON.

ENGINES IN USE.

There are several gas engines in use in Colombo, but not elsewhere in the island, as Colombo contains the only considerable gas plant in Ceylon.

The Colombo Electric Light Company has two in use; the Galle Face Hotel has two, one for pumping and one for elevator work; the electroplating works have one, and two, at least, of the newspaper establishments have one each. All of these engines were made in Great Britain, and are working satisfactorily. They range from 4 to 27 horsepower. The cost of the latter, erected in Colombo, was $1,170. There are at least five gas engines for sale in Colombo now, with no buyers.

FUEL.

Cardiff coal is at present $18 per ton, usual price $9; bulk petroleum is 23 cents per gallon; liquid fuel (crude petroleum) 4 cents per gallon.

TRANSPORTATION AND FREIGHT RATES.

Machinery can be transported from the United States to Colombo by the Indo-American line of steamers, involving transshipment at Bombay, at about $15 per ton, and by the North German Lloyd steamers, involving transshipment in Europe, at about the same rate, probably. The freight from Great Britain to Colombo is about $5 or less per ton.

W. MOREY, *Consul.*

COLOMBO, *October 1, 1900.*

CHINA.

HANKAU.

ENGINES IN USE.

I am unable to learn of any gas engines in the consulate of Hankau, except at the port, and the number used here is about one dozen. At present, most of the firms that require them are supplied, but no doubt when business resumes its former progressive condition, there will be a limited demand for them among foreign firms, and, possibly, in the future, among natives. Most of these engines are manufactured by the Dresdner Gasmotorenfabrik, of Dresden, Germany, and H. Schlichting, a German resident agent, has made nearly all the sales, except one or two engines that were imported from England; so that this firm has a decided advantage, as the engines seem to give satisfaction. Most of them are 2 to 4 horsepower. One used at the Grand Hotel for the electric-light plant is 25 horsepower. These engines are shipped by the Suez Canal and arrive at Shanghai, where they are transshipped to river steamers. The entire shipment from Germany and England is by water, with only one transfer, as above. They all use kerosene oil, not of the highest grade. They buy it in cases containing two tins holding 64 pounds of oil. The price per case is $3 Mexican, or about $1.50 gold. The operators claim that one case of oil will run a 4-horsepower engine twelve to fifteen hours.

The prices of the Dresdner Gasmotorenfabrik's engines at the factory, with foundation and accessories, are, for 1, 2, 3, 4, 8, 12, 20, and 30 horsepower, $297.50, $368.90, $464.10, $559.30, $940.10, $1,166.20, $1,570.80, and $2,046.80, respectively, with revolutions per minute for 1-horsepower to 12-horsepower, both included, of 250, 240, 240, 230, 200, and 180, respectively. The weights of engines 1, 2, 3, 4, 8, and 12 horsepower were 1,364, 1,760, 2,046, 2,816, 5,500 and 7,900 pounds, respectively.

The following describes an English machine:

John H. Hockworth & Co., London, "Hero" gas engine.

[All engines except the 1½ and the 4 horsepower have two fly wheels.]

Horsepower.	Over all dimensions of engine.		Weight.	Diameter and number of fly wheels.		Revolutions per minute.	Price, with water tank.		
	Length.	Width.							
	Ft. in.	*Ft. in.*	*Cwt.*	*No.*	*Ft. in.*		£ *s.*		
2	5 0	2 6	12	1	3 0	250	26	10	$128.66
3	6 2	2 9	15	2	3 0	250	31	0	150.86
4	7 3	3 9	25	1	4 0	200	44	0	214.13
5½	7 6	4 0	30	2	4 0	200	52	0	253.06
7½	8 2	4 6	39	2	4 4	180	63	0	306.59
10½	9 0	4 8	48	2	4 4	180	76	0	369.85
14	10 0	5 4	58	2	4 6	180	92	0	447.72
18	10 6	5 6	63	2	5 6	180	109	0	530.45
23	11 0	6 6	76	2	5 6	160	127	0	618.05
29	11 0	6 10	86	2	6 6	160	148	0	720.24

Packing and delivering f. o. b., London or Hull, 6 per cent extra.

FUEL.

Kerosene-oil tanks are being built at this port by a German firm, and when they are completed oil will be sold in bulk, and no doubt the price of oil will then be slightly cheaper.

Coal for steaming purposes comes from Japan. The prices vary, but usually it costs $3.50 to $5, gold, per ton. In 1898 it advanced to $8, gold, per ton.

Extensive coal fields are found in this consular district in the provinces of Hupeh, Kiang-si, and Hunan; also in Szechuan, which borders on this district. A good quality of steaming coal has been found in Hunan province. The varieties of coal are bituminous, anthracite, and lignite. In all of the above regions coal is mined in a primitive manner, and the price of hard and soft coal is the same. The price for the past year has varied but little, being $5, gold, per ton. At present it is very scarce, and the prices are advancing. The majority of the Chinese that use coal seem to prefer coal dust, for they mix the latter with a small quantity of clay and add water to it until they can work it in their hands, when it is made into balls the size of their fists, burning it in their native stoves. No doubt, when the railways that are surveyed and partially built are completed, the extensive coal fields will be worked by modern methods.

There are no gas plants and only two small electric-light plants in this district. Gasoline, crude oil, and distillates are not used for fuel in this section. Two steamers, built last year to run between this port and Shanghai, were fitted with engines for using kerosene oil, but after two trips they discontinued the use of oil and now use Japanese coal.

TARIFF.

The tariff on machinery imported into China is 5 per cent ad valorem.

FREIGHTS.

The freight on machinery from the United States I am unable to give, as none has been shipped into this district. The freight rates on general cargoes from here to New York will give some idea as to the rates per ton: Shanghai to New York, via London, $13, gold; sail, $6.50; via San Francisco, $30.

OUTLOOK FOR AMERICAN ENGINES.

If Americans desire to secure their share of the trade of China, they must either have their goods displayed in a permanent exposition in a few of the large cities, or have resident agents in the principal open ports to work up trade and keep that trade well supplied with catalogues. The Germans are very active, and are constantly pushing all lines of goods suitable for this market.

L. S. WILCOX, *Consul.*

HANKAU, *October 31, 1900.*

DUTCH INDIA.

JAVA.

ENGINES IN USE.

After a careful inquiry, I find that there are no gas engines in use in this consular district. Some few small portable engines are run by oil, but it is found to be much dearer than other fuel. Engines are now manufactured here by the Dry Dock Company, other private foundries, and by the Government railway works.

Those imported come from Holland and Belgium, and most of the locomotives on the Government railways are manufactured in Belgium.

Gas engines not being used, I am unable to quote prices of same. At the present time, it is not possible to use gas engines profitably, as the expense of running them with gasoline would be far too great. Gas is used only in three of the largest places in Java—Batavia, Samarang, and Surabaya. Therefore these engines could not be employed in the interior.

FUEL.

Gasoline is not manufactured in Java, and only a little is imported by private individuals for running automobiles. Therefore, I am unable to quote prices. Other fuel available is kerosene, at a cost of 25 cents per gallon if bought in small quantities, and 20 cents if bought by the case; crude oil (local oil), at 15 cents per gallon.

The following are the prices of coal per ton: Welsh coal, $9.50; Australian, $7.75; Sumatra, $5.85; Japanese, $7.25. No other fuel is used here for steam boilers.

TRANSPORTATION AND FREIGHT RATES.

There are many different routes for transportation from the United States to Dutch India. The most direct routes are, from the Eastern States, either to London or Liverpool, with transshipment direct to Java—from London by the Queensland Line of steamers, and from Liverpool by the Ocean Line; or to Amsterdam or Rotterdam, with transshipment direct to Java—from Amsterdam by the Netherlands Steamship Company, and from Rotterdam by the Rotterdam Lloyds.

From our Western States, transportation would have to be via Hongkong and Singapore.

B. S. Rairden, *Consul.*

Batavia, *November 30, 1900.*

HONGKONG.

ENGINES IN USE.

There are no gas engines, to my knowledge, in this colony. There are perhaps three small gasoline engines here. From my observation, I am unable to form an opinion as to whether there will ever be a field here for gas engines. It is possible, of course, that if one were set up here and it could be clearly demonstrated that it was superior to a steam engine for pumping stations, sugar refineries, dry docks, rope mills, and launches, there would be a large field; but it will be many years before they can be introduced here to any extent for running elevators, steam drills, or small factories, as the field will be too limited in these lines. To-day, there are six elevators and two steam drills in Hongkong. It is only within the last three years that office buildings of over two stories have been built to any extent.

FUEL.

Neither coal nor kerosene is found in this district. The cheaper oils all come from Sumatra and Russia. The gas company here supplies gas at $3 Mexican ($1.50 United States) per 1,000 cubic feet.

TRANSPORTATION AND FREIGHT RATES.

The cheapest way to transport machinery to this colony is via sailing vessel from either New York or San Francisco. There are two lines of freight steamers running to New York direct from here. The connection between here and San Francisco is via the Pacific Mail Steamship Company, and from Portland via the Northern Pacific.

Rounseville Wildman,
Consul-General.

Hongkong, *October 5, 1900.*

JAPAN.

FORMOSA.

ENGINES IN USE.[1]

Gas engines are not in use in Formosa, owing to the absence of both coal gas and gasoline. The former is not manufactured in the island and the latter is not imported; in fact, it is not for sale, I believe, anywhere in the East. Unfortunately American manufacturers have confined themselves, with two or three exceptions, too closely to the production of gas and gasoline motors, and thus a market in eastern countries, where kerosene can be purchased everywhere, has been left largely to England and Germany, who have given special attention to the manufacture of kerosene motors. The demand for light power in Formosa does not appear to be extensive, however, and the very high prices asked, especially for the English motors, has prevented them from being a subject of much interest.

Two inquiries were made at this consulate this year for small kerosene marine motors, and applications were accordingly made to some twelve of the largest launch-motor builders in the United States; but no party addressed was able to fill the order, though attractive propositions regarding gasoline motors were numerous.

FUEL.

The only oils for motor use to be obtained in the island are Russian petroleum, at 12 cents a gallon, and American "Comet" oil, at 15 cents a gallon. Steamer coal sells at from 5 to 6 yen ($2.50 to $3) a ton. Freight to Formosa from New York or Pacific coast ports ranges from $11 to $13 a ton.

OUTLOOK FOR AMERICAN ENGINES.

If our manufacturers could put on the market a small kerosene marine motor at a price comparing favorably with the present cost of gasoline motors, of simple construction, safe and reliable, and easy to operate, they would undoubtedly find numerous customers in the Far East. There are some twenty launches in Tokyo and two in Nagasaki, I believe, fitted with kerosene-oil motors, which are of San Francisco manufacture, but they are very expensive as compared with some of the gasoline motors.

OIL ENGINES.

The Japanese have lately introduced into the island the Campbell oil engine, manufactured in England. It is extensively advertised in

[1] The duty on engines imported into Japan is 10 per cent.

connection with a light Japanese weaving machine known as the Toyoda, which has been lately invented. The latter has been successfully introduced into Japan, and several influential Japanese are endeavoring to induce the local Chinese to adopt it. The agricultural and industrial section of the Formosa government recommends it, and a complete apparatus, including engine, is at present on exhibition in the commercial museum. One wealthy native has already ordered a set of 20 looms and it is believed that other orders will follow. The 1-horsepower engine will run 20 looms, and the price for the looms, spinning machine, reeling machine, extra parts, and engine complete is 1,760 yen ($880). The oil engines are advertised separately at the following prices:

Horsepower.	Price.		Horsepower.	Price.	
	Yen.			*Yen.*	
1	750	$375	13	2,387	$1,193
3	950	475	15	2,500	1,250
4	1,276	638	17	2,673	1,336
5	1,452	726	20	2,900	1,450
7	1,628	814	25	3,300	1,650
9	1,859	929	30	3,784	1,892
10	2,100	1,050			

JAMES W. DAVIDSON, *Consul.*

TAMSUI, *September 22, 1900.*

OSAKA AND HIOGO.

ENGINES IN USE.

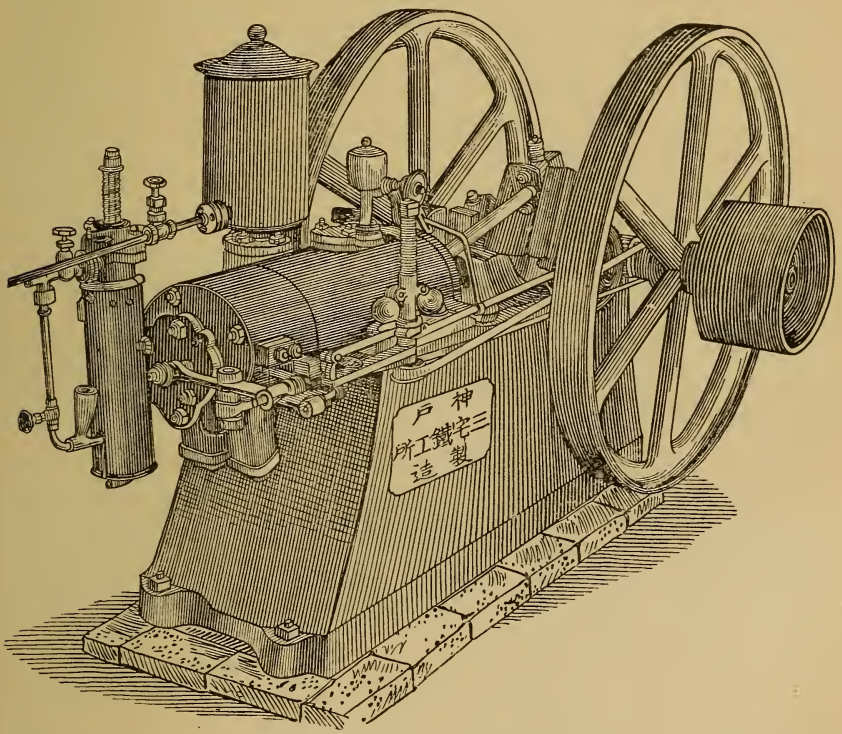
Engines using ordinary illuminating coal gas are used very little here, on account of the restricted area over which the gas is supplied, the number being limited to two or three. In the Hiogo district, there are only two small gas companies in operation, a third being but partially formed. There is a large gas company projected in Osaka, but it will be some time before it will be in operation.

Oil engines have taken the place of gas engines here, and the fuel employed is kerosene. An English manufacturer of aërated water in Kobe informed me that he has had in constant use for fifteen months an oil engine for working his plant, and it is in as good condition now as when new. It is of English make, 2½ horsepower, and was imported by the agents of the makers, the price being 650 yen ($323.70).

Both gas and oil engines are being manufactured by the Japanese in Osaka and Kobe. I understand they are well made and work satisfactorily. Quite a number of these engines are being used in the local printing offices and rice mills.

The factories in Osaka (the admitted manufacturing center of Japan, with a population of 1,000,000) using electric motors or oil engines to

drive the machinery have increased considerably of late. The factories in which electric motors are fitted numbered 91 at the end of last year, an increase of 50 over the preceding year. Those fitted with oil engines numbered 103 at the end of last year, against 61 at the end of the preceding year.



The above cut represents an oil engine advertised by the manufacturers, Miyake Iron Works, of Kobe.

The advertisement states: "This horizontal oil engine of new pattern can be converted into a gas engine. It is very handy and can be worked simply by turning gas into the pipes instead of oil."

Price list for oil or gas engines.

Horsepower.	Revolutions.	Price.		Horsepower.	Revolutions.	Price.	
		Yen.				*Yen.*	
3	230	550	$273.90	15	190	1,350	$672.30
5	220	700	348.60	20	180	1,700	846.60
7	210	850	423.30	25	170	2,050	1,020.90
10	200	1,100	547.80	30	160	2,400	1,195.20
12	200	1,150	572.70				

With Japanese-manufactured engines in the market at prices above quoted, and the present supply of gas being limited, it would seem

that there would be but little profit in the introduction from the United States of gas engines, so far as this consular district is concerned.

FUEL.

Up to a short time ago, all the kerosene consumed in this country was imported, and as steamers objected to take as ordinary cargo gasoline, kerosene, and many volatile oils, the uncertainty of supply restricted the use of this class of engines. The petroleum districts of Japan are, however, now receiving attention, and ample supplies of kerosene and its by-products will soon be obtainable.

A company floated with a view to developing the petroleum industry of Japan was registered on the 15th instant. The approved capital of the concern is 10,000,000 yen ($4,980,000), of which 9,780,000 yen ($4,870,440) is said to be subscribed by an agent of the Standard Oil Company.

The present quotations of American kerosene (115 test) are 3.20 yen ($1.59) per case of 10 gallons, and of Japanese coal (bituminous), 8 yen ($3.98) per ton.

TRANSPORTATION AND FREIGHT RATES.

As to the facilities for transporting machinery from the United States to this port, there are seven steamship lines plying between here and the Pacific coast, and numerous other steamers to the Atlantic coast via Suez. Rates of freight for foreign shipments can best be obtained in the United States.

HUNTER SHARP,
Vice-Consul.

OSAKA AND HIOGO (Kobe), *November 27, 1900.*

YOKOHAMA.

ENGINES IN USE.

There is practically no demand for gas engines in this district, owing largely to the very limited supply of gas with which to operate them. The gas works have a very limited capacity, and their product is all required for illuminating purposes. There are no gas engines in Yokohama, and only ten or twelve in the district. I am told that the few in use in Tokyo are giving good satisfaction, and if gas could be easily procured for operating the machines the demand would doubtless rapidly increase. These engines are shipped from the United States and sell here at American prices plus 15 or 20 per cent profit.

Oil engines are in good demand, and dealers inform me that this could be made a profitable field for machines of that character.

TRANSPORTATION AND FREIGHT RATES.

Freight rates on goods bound for Japan all emanate from and are determined in the United States, and the constantly changing schedules make it impossible to determine these rates in the East with any degree of accuracy.

The following steamship lines, connecting with transcontinental lines of railway at San Francisco, Portland, Oreg., Tacoma and Seattle, Wash., furnish the usual means of transportation for American shippers to Japan: Pacific Mail Steamship Company, Occidental and Oriental Steamship Company, Toyo Kisen Kaisha, and Northern Pacific Steamship Company.

FUEL.

Gasoline is very scarce and expensive here, owing to the disinclination of carriers to transport such a dangerous article on vessels from Europe or America. With the development of the Japanese oil wells, it is expected that this market will be soon abundantly supplied with the article at prices which will justify its use as fuel.

Kerosene oil is imported from the United States and Russia, and a considerable quantity comes from the Japanese oil wells. It is generally supplied in cases containing two 5-gallon tins, but also in bulk. The price varies from $1 to $1.50, United States gold, for 10 gallons.

The crude oils at present available are from the Japanese wells in Echigo province, and they have a large variation in quality, the corresponding prices varying from 75 cents to $1.37 per koken (39.7033 gallons) at the wells.

Distillates from Japanese crude oil are also available, in small quantities.

Inferior grades of coal may be had for about $3 per ton, and prices range from that amount to $14 for Cardiff coal.

E. C. Bellows,
Consul-General.

Yokohama, *September 14, 1900.*

KOREA.[1]

ENGINES IN USE.

No gas engines are in use in Korea, and there appears to be no immediate prospect of a need for them arising. Koreans perform all labor by hand, and foreigners employ steam power in the few manufactures in which they are interested.

[1] The Korean import duties are 7 per cent ad valorem.

FUEL.

The fuel available for gas engines is kerosene, all of which is imported, chiefly from the United States. Last year, this importation amounted in value to 545,269 yen ($271,543). A case of 10 gallons of the cheapest grade of oil retails for 3.25 yen, equal to 16 cents per gallon, while the better quality sells at from 4 yen ($1.99) upward per case of 10 gallons. Soft bituminous coal from Japan, of poor quality, brings 14 yen ($7) per ton.

TRANSPORTATION AND FREIGHT RATES.

Both manufactures and raw materials intended for Korea are billed to Shanghai (China) or to a Japanese port and transshipped. Since the opening of this country to foreign commerce, only two vessels have arrived in Korea directly from the United States.

The following are the average rates of freight between the points named:

London to Kobe, via Suez, £2.50 ($10.95) per ton weight of 2,240 pounds, or 40 cubic feet measurement. New York to Kobe, via Suez, practically identical. Chicago to Kobe, via the Pacific, $12 per ton of 40 cubic feet. San Francisco to Kobe, via the Pacific, on general merchandise $10, but the rate varies between $8 and $12 per ton of 40 cubic feet, and per ton weight of 2,000 pounds. Kobe to Chemulpo, 7.20 yen ($3.58) per ton of 40 cubic feet, or 2,240 pounds. In the early part of the year, the rate was 6 yen ($2.98) per ton. Shanghai to Chemulpo, 5.80 yen ($2.88) per ton weight or measurement, at option of steamer. Rates by this route remain fairly steady. London to Chemulpo, including transshipment at Nagasaki, is now £3 ($14.60) per ton measurement or weight.

HORACE N. ALLEN,
Consul-General.

SEOUL, *September 21, 1900.*

SIAM.[1]

ENGINES IN USE.

There are no gas engines in use in Siam. The fuel used in this country is rice husks, wood, and coal. The latter is rapidly finding favor because of its smaller bulk and because of the increased expense of wood. The price of Cardiff coal is $22 to $23 Mexican (say $11 and $13.50 United States) per ton, an increase of about $4, Mexican, per ton over the price of last year.

[1] Customs duties on imports, 3 per cent ad valorem.

TRANSPORTATION AND FREIGHT RATES.

There is a large line of freight steamers running between Bangkok and Hongkong, and also between this city and Singapore. These, together with a few tramp steamers, furnish the facilities for freight transportation. All goods have to be transshipped at one of these ports. The cost of freight from New York to Bangkok is from $9 to $12, gold, per ton, depending upon its classification.

OUTLOOK FOR AMERICAN ENGINES.

There is no gas plant here, and gasoline seems to be out of the question because of the objection made by steamship companies to carrying it as freight; hence the possibility of introducing engines depending upon such motor power is quite remote. On the other hand, the rapidly increasing cost of fuel such as is now used would argue that engines that can be propelled by gas generated from crude petroleum ought to find a market here, if introduced in the right manner. This should be done through an agent who would guard against accidents, instruct in the use of machines, and thus, by careful handling from the first, assure the people of their safety and practicability.

The possibilities of the trade if once introduced are large. There are probably 500 launches of all sizes in and about the city of Bangkok. The great rivers of Siam and the vast network of canals all over the great alluvial plain of southern Siam furnish waterways thousands of miles in extent. These are the only highways of travel and commerce outside of this city, and the traffic of the country is rapidly increasing. Could some satisfactory motor power be introduced that would be less bulky and heavy than the cumbersome steam engine, it must immediately create a great demand. A lighter weight motor would mean the construction of launches of lighter draft. This would immediately open up the great majority of the canals for a part of the year, and many of them the year round. The rivers now navigable by steam launches for hundreds of miles would prove navigable for such craft twice the distance, and the movement would work a great change in opening up the country by a more rapid means of transportation than is possible with the hand-propelled boats of the country at present in use.

HAMILTON KING,
Consul-General.

BANGKOK, *January 7, 1901.*

TURKEY IN ASIA.

BEIRUT.

ENGINES IN USE.[1]

No gas engines are in use anywhere within the limits of the Beirut consular district, Syria. There is, however, a gas plant in this city, operated by the Société Ottomane du Gaz de Beyrouth (capital, $160,000), furnishing gas for lighting the city (645 public and 5,150 private lights; price to consumers, 4 to 5 cents per cubic meter, or 35.316 cubic feet), and to a limited degree for cooking purposes, a few stoves for that purpose having been introduced by the gas company from France. This syndicate has an exclusive monopoly of the manufacture and sale of gas in Beirut, and no other gas plant exists in my district. It is said to be more than likely that the Beirut gas works in the near future will pass into the hands of H. Sabbag & Fils, of Beirut, and that they will be considerably enlarged and their service extended. Mr. Ibrahim Sabbag, the active head of said firm, is now on his way to the United States, to buy gas motors, stoves, fixtures, etc., and also coal.

OUTLOOK FOR AMERICAN ENGINES.

While American gas engines may find a limited market in Beirut, there are at present no prospects of a larger field in Syria. I think petroleum engines will better suit the conditions of this country.

FUEL.

The Beirut gas plant consumes annually some 2,000 tons of coal, which cost the company in 1899, $6.52 and in 1900 $7.72 per ton. The regular market price for coal in Beirut is at present as follows: Cardiff briquettes, $11.19; lump coal, $10.62. For the production of gas, some Turkish coal (charbon d'heraclée) has been bought of late at the rate of $7.72 per ton in Beirut; it enters free of duty. English coal and Russian petroleum have figured for some years as the most available fuels in this locality, the latter commodity selling at present in this market for $1.34 per box of two cans, holding in all 65 pounds net of refined oil.

FREIGHT RATES.

Reasonably low freight rates are obtained via Barber & Co.'s direct steamers (Produce Exchange, New York).

G. Bie Ravndal, *Consul.*

Beirut, Syria, *September 29, 1900.*

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[1] A uniform duty of 8 per cent is collected on all imports into Turkey.

ERZERUM.

ENGINES IN USE.

No gas engines or engines or machines of any description whatsoever are in use in the province of Erzerum, and there is not the slightest possibility of their profitable introduction.

FUELS.

The only fuels available are kerosene, wood, and dried dung, the first costing 88 cents a tin, the second $18 a cord, and the last a cent a cake, a cake being a foot square and 3 inches in thickness.

TRANSPORTATION AND FREIGHT RATES.

Machinery can be transported to Trebizond, on the Black Sea, the port of entry for this district, by steamer from New York to Marseilles, London, and Constantinople, and then reshipped direct to Trebizond. There is no line of steamers running between the United States and Black Sea ports.

From Trebizond to Erzerum, a distance of 160 miles, transportation in summer is by wagon, ox cart, horse, donkey, and camel, and in winter by camel alone, the cost depending upon the season of the year, the supply of animals, and the nature of the goods.

LEO BERGHOLZ, *Consul.*

ERZERUM, *September 7, 1900.*

SIVAS.

ENGINES IN USE.

Gas engines are not used in this consular district. Until the country is more developed and factories are established, I do not think gas engines can be profitably introduced here.

FUEL.

Cow manure is the principal fuel. Wood is scarce and expensive. Coal is not mined or imported. Gasoline, crude oils, or distillates are not found. Kerosene oil costs at Sivas from $1.30 to $3 a box of 65 pounds net.

TRANSPORTATION AND FREIGHT RATES.

The Barber Steamship Company is the only line running direct boats from the United States to Constantinople. There are nine European steamboat companies having a regular service between Constantinople and Samsoun, the chief port of entry for this consulate. Camels, horses, and wagons are the means of transportation in the interior.

MILO A. JEWETT, *Consul.*

SIVAS, *October 2, 1900.*

AUSTRALASIA.

NEW SOUTH WALES.

ENGINES IN USE.

There are only three gas engines in use in the Newcastle district; two of these are from San Francisco and the other from Detroit. The cost varies from $600 to $750. Gasoline engines are now used in launches and are well liked, but there is little or no likelihood of their being used for any other purpose. So much, however, depends on the federation of the colonies that a report prepared at this time will not apply when that arrangement is perfected. New industries will spring up and a demand be created for lines of manufactured goods never before seen here. I would not advise any move to be made in this matter until more is known of the fruits of federation.

FUEL.

Coal is the only fuel found here; other fuels are imported. Coal sells for 11s. ($2.68) per ton; gasoline, 20 cents per gallon; kerosene, from 10 cents to 12 cents per gallon, and crude oils about the same.

DUTY.

There is no duty levied on any of the foregoing articles entering New South Wales.

TRANSPORTATION AND FREIGHT RATES.

There are four regular lines of steamers plying between the United States and Australia.

The rates of freight vary from $5 to $10 per ton.

F. W. GODING, *Consul.*

NEWCASTLE, *November 6, 1900.*

QUEENSLAND.

ENGINES IN USE.[1]

Gas engines are in use in all large towns in Queensland. There are probably about 700 in use in the colony.

The price for a 4-horsepower engine is about $500. This is the most common size in use; prices of other sizes are in proportion. The engines have been imported from the United Kingdom and the United States—about 75 per cent of the total from the former.

At the present moment, a vessel of about 300 tons register is being fitted with two light oil engines, to burn benzine, I believe, of 30 horsepower each, and a pair of similar engines have just arrived to be fitted in another vessel of 300 tons.

There is a difficulty in introducing light oil stationary engines for use in this colony, on account of the long, hot summer, which makes volatile oils dangerous to handle, and the people are not used to them. The transportation charges, also, are almost prohibitive for the above-mentioned reasons. For instance, a gallon of gasoline can be sold in Brisbane for 54 cents, but it could not be sold in Charters Towers, a town 800 miles by sea and about 100 miles by rail north of Brisbane, under $1.08.

OUTLOOK FOR AMERICAN ENGINES.

There is a large business to be done in gas engines in this colony, but it requires persons skilled in the handling of light oils to show the people here that they are safe to handle, and generally to explain the advantages of gas engines over steam.

FUEL.

The available fuels are gas, coal, and wood. Gasoline and kerosene sell for 54 and 48 cents, respectively, per gallon. Crude oils and distillates are not imported. The price of coal suitable for steam boilers is $2.43 per ton of 2,240 pounds. These are the prices in Brisbane.

TRANSPORTATION AND FREIGHT RATES.

The facilities for transportation of machinery are per steamer from New York to Brisbane via southern ports of Australia. The rate of freight is about $9.73 per ton measurement with 10 per cent primage added, but if shipments were being made, I have no doubt lower terms could be secured in New York.

W. J. WEATHERILL,
Consular Agent.

BRISBANE, *December 18, 1900.*

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[1] Free of duty.

TASMANIA.

ENGINES IN USE.[1]

Gas engines are used to a small extent in the two principal cities of the colony, Hobart and Launceston, where intermittent powers are required. With the exception of a small town, the two places mentioned are the only ones in Tasmania that have gas works. In Launceston, where abundant water power is available, a large electrical plant has lately been installed, and in addition to lighting the entire city, the current is available for driving motors, which are superseding the use of gas engines. The high price charged for gas, viz, 7s. 6d. ($1.83) per 1,000 feet, also limits the use of gas engines. Those in use are almost all of English manufacture.

OUTLOOK FOR AMERICAN ENGINES.

There is an opening for oil engines simple in construction and reliable in working. A good marine-type engine would also find sale.

Any catalogues, etc., sent to this office will be placed in the hands of those interested.

FUEL.

There is no natural supply of fuel of any kind suitable for driving gas engines. Coal for steam boilers costs from 16s. to 20s. ($3.89 to $4.86) per ton; wood, 5s. to 7s. ($1.22 to $1.70) per ton of 2,240 pounds.

TRANSPORTATION AND FREIGHT RATES.

There are ample facilities for transportation from the United States by sail and steam. The present rates are considerably cheaper than from English ports. There is no direct communication. All goods come via Sydney or Melbourne. Freights from either of these places to all Tasmanian ports are 10s. ($2.43) per ton.

A. G. Webster, *Consul.*

Hobart, *October 4, 1900.*

VICTORIA.

ENGINES IN USE.

In this colony, gas engines are extensively used, and the demand is increasing. Of those on the market here, some are imported from

[1] Duty: Engines, 10 per cent; kerosene, gasoline, etc., 12 cents per gallon; crude kerosene, for engines, 6 cents per gallon.

England, but the bulk are manufactured in the colony, the local maker having the advantage of a 15 per cent import duty.

Horsepower.	Price.	
½	£25	$121.66
1	45	218.99
1½	55	267.65
2	65	316.32

Oil engines are in better demand here than gas engines, and there are some very good styles of the former, imported from England, selling here, of ½, 1, 1½, and 2 horsepower mainly; very few engines, gas or oil, of larger sizes being sold.

FUEL.

In the cities, only gas is used as a fuel and in the country, mainly oil. The fuels available are gasoline, at 60 cents per gallon; kerosene, at from 16 to 18 cents per gallon—though at the present time on account of its scarcity it is 30 cents—and shale oil, at $43.79 per ton.

OUTLOOK FOR AMERICAN ENGINES.

There seems no reason why American engines should not compete here, provided they are of high-class grade and can be had by the purchaser at or below the prices quoted. If catalogues, price lists, and all other particulars are sent to this consulate-general, they will be placed before the most responsible firms in the colony handling this class of machinery.

TRANSPORTATION AND FREIGHT RATES.

Every facility in the way of transportation from the United States by either steamer or sailing vessel from New York is offered, the freight rate at present being too unreliable to quote.

JOHN P. BRAY,
Consul-General.

MELBOURNE, *November 1, 1900.*

AFRICA.

ALGERIA.

ENGINES IN USE.

There are about 200 gas engines in Algeria. The price of a 4½-horsepower engine is about $700. They are brought mostly from France, especially the smaller ones; larger ones, such as the Crossley, are imported from England. The principal French engines in use here are the Otto and the Charon.

FUELS.

Gas is available in the larger cities. Gasoline, kerosene, crude oils, and distillates can be bought here. The price of coal fluctuates, but the normal price is about $10 per ton.

TRANSPORTATION AND FREIGHT RATES.

The greatest drawback to the importation of American machinery and American merchandise of any kind is the lack of a direct steamship line to Algeria. Goods have to be brought via Liverpool, Hamburg, Marseilles, and other ports, so that it is impossible to give freight rates.

OUTLOOK FOR AMERICAN ENGINES.

The people of Algeria are very favorable to American goods of all kinds, especially machinery, and as soon as a direct steamship service is established, a ready market will be found in this colony.

DUTIES.

The customs duties on gas engines are the same as for France, of which Algeria is a province, viz, 18 francs per 100 kilograms ($3.47 per 220.46 pounds).

DANIEL S. KIDDER, *Consul.*

ALGIERS, *September 3, 1900.*

BRITISH SOUTH AFRICA.

ENGINES IN USE.

Gas engines are but little used in South Africa at the present time, only a few having been introduced; these do not exceed 10 horsepower. England and the United States have been the only sources of supply thus far. It is a question whether the demand for gas engines will increase for many years to come.

The following prices, less 45 per cent New York, prevail:

Actual horsepower.	Floor space.	Driving pulley, diameter face.	Revolutions per minute.	Weight.	Price.
	Inches.	*Inches.*		*Pounds.*	
5	28× 59	12× 8	250 to 325	2,200	$440
8	30× 65	18×12	250 to 300	3,000	550
10	30× 67	18×12	250 to 300	3,500	638
15	35× 79	24×16	225 to 275	4,500	880
20	42×100	30×10	175 to 225	8,000	1,100
25	42×103	33×10	175 to 225	8,500	1,264
30	52×118	36×12	150 to 200	10,000	1,430
35	52×120	42×12	150 to 200	11,000	1,540
40	58×130	42×14	150 to 180	13,000	1,870
50	58×132	48×14	150 to 180	15,000	2,200
60	58×134	48×14	150 to 180	16,000	2,530

FUEL.

Gasoline, kerosene, and crude oils all come from the United States, while coal suitable for steaming comes from Cardiff.

TRANSPORTATION.

Transportation from the United States to British South Africa is by steamers from the port of New York.

J. G. Stowe,
Consul-General.

Cape Town, *September 5, 1900.*

CANARY ISLANDS.

ENGINES IN USE.[1]

No gas engines of any kind are in use in the Canary Islands. There is electric light on the islands; candles and petroleum, the latter being all imported from the United States, are also used.

FUELS.

The fuels available are wood, charcoal, and coal. The price of coal is very high at present, being sold to consumer at from $7.30 to $9.72

[1] Machinery and engines enter the Canary Islands free of duty.

per ton. Petroleum sells per case, containing 2 cans of 5 gallons each, for 16.50 pesetas ($2.50); the consumption tax (octoa) is 6.30 pesetas (96 cents) per 10 gallons.

TRANSPORTATION AND FREIGHT RATES.

It is impossible to give freight charges, as everything is shipped via England, except things brought over in sailing vessels specially chartered for this place.

SOLOMON BERLINER, *Consul.*

TENERIFFE, *August 28, 1900.*

EGYPT.

ENGINES IN USE.[1]

Gas engines are used to a considerable extent in Egypt, but owing to the high price charged for gas by the local companies, preference is given to engines using petroleum as fuel, the operating expenses of the latter being, on an average, only about one-half as great as those of the former.

These engines are imported by sea from England and Germany, the leading manufacturers represented in this field being Tangyes, Limited, Birmingham; Crossley Bros., Manchester; Ruston, Proctor & Co., and the French makers of the "Otto" engines.

The following are the prices at present current in Cairo for the engines indicated:

Horsepower.	Engines.	Prices.		Free on board at—
		Gas.	Petroleum.	
2½	Crossley's	$257.92	$452.58	Alexandria.
10	do	549.91	817.57	Do.
21	do		1,328.55	Do.
25	do	1,056.03		Do.
2	Tangyes'	237.26	487.87	Cairo.
10	do		984.90	Do.
12	do	554.21		Do.
16	do	756.28	1,283.95	Do.
1½	Ruston & Proctor's		437.99	Alexandria.
10	do		924.64	Do.
24	do		1,362.62	Do.
2½	R. Hornsby & Sons, Limited		437.98	Do.
12½	do		1,094.96	Do.
20	do		1,508.61	Do.

FUEL.

The fuel usually employed in oil engines in Egypt is either kerosene or some oil specially prepared by the company manufacturing the engine. Prices to-day in Cairo are as follows:

[1] Import duty, 8 per cent; charges, cartage, etc., estimated at 3 per cent.

Kerosene, per case of 8 gallons in 2 tins: American, $2.22; Russian, $1.48.

Gasoline (rectified), in quantities of 10,000 liters (2,642 gallons): $8.68 per 100 liters (26.4 gallons).

Oléonapthe (No. VII), the so-called "globe oil," in barrels, f. o. b. Cairo, 5.9 cents per liter (1.05 quarts). This globe oil is extensively used here for fuel in engines; it is also used in the oil locomotives at present being tried on the Helouan Railway.

Coal, per ton, f. o. b. Alexandria: Newcastle, large, $8.14; Cardiff, large, $10.46.

TRANSPORTATION AND FREIGHT RATES.

Freight from the United States for Egypt is usually shipped via Liverpool to Alexandria. I have been unable as yet to ascertain the exact freight rate from New York to Alexandria, although this report has been considerably delayed through my endeavor to do so; but an approximate figure is shown by the outward-bound rate, which follows: Ocean freight, Alexandria to New York, on engines and machinery is 50 shillings ($12.15) per ton weight or measurement, at steamer's option; rail freight, Alexandria to Cairo, on machinery is $5.56 per ton, and on engines, $4.20 per ton.

JOHN G. LONG,
Agent and Consul-General.

CAIRO, *November 14, 1900.*

MADAGASCAR.

ENGINES IN USE.

There are no gas engines in use on this island, and I am sure that conditions are such that there is no possibility of their profitable introduction at present.

FUELS.

The available fuels here are native hardwood and a French patent fuel. The present prices for coal and wood are respectively from $12 to $15 per ton and from $5 to $6 per cord.

TRANSPORTATION AND FREIGHT RATES.

There is little or no inducement for direct shipments of merchandise from the United States to Madagascar. The usual means of transportation, by reshipment at Havre and Marseilles, do not promote commercial relations between the two countries.

Freight rates from the United States can not be ascertained here.

DUTIES.

The tariff rates on gas engines are as follows, per 100 kilograms (220.46 pounds): For boats, with boiler, $6; without boiler, $3.60. For roads, without boiler, $4; with boiler, $5.

M. W. GIBBS, *Consul.*

TAMATAVE, *October 1, 1900.*

LIBERIA.

ENGINES IN USE.[1]

Gas engines are not in use in Liberia. There is, however, a small engine in use in a Monrovian workshop, and two engines in German launches used in river navigation, all three employing kerosene for fuel. These launch engines, made in Germany, do not give general satisfaction, as there is no certainty of their being in working order at all times. I do not think there is any opening for gas engines, or, indeed, for engines of any kind, in this Republic.

FUELS.

The fuels available are kerosene, gasoline, crude oils, and coal, which are imported from England and Germany.

TRANSPORTATION AND FREIGHT RATES.

American products of all kinds exported to Liberia must come by way of Liverpool, Hamburg, or some other European port, entailing double freightage, and, of course, great disadvantage to our trade.

OWEN J. H. SMITH,
Consul-General.

MONROVIA, *September 19, 1900.*

LOURENÇO MARQUEZ.

ENGINES IN USE.

As there are no gas plants in this country there can be, in consequence, no demand for gas engines.

FUELS.

The only available fuels now are kerosene oil, at 45 cents per gallon, and Welsh coal, at $15 per ton.

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[1] Engines, machines, and tools admitted free.

TRANSPORTATION FACILITIES.

The facilities for the transportation of machinery from New York to this port are, at present, very limited.

W. STANLEY HOLLIS, *Consul.*

LOURENÇO MARQUEZ, *October 13, 1900.*

MADEIRA.

ENGINES IN USE.

As Funchal is lighted by electricity, there are no gas engines in this consular district.

FUELS.

No gasoline or crude oils are available. Nearly all the kerosene used is from the United States, a little coming from Russia. A case of 10 gallons retails in this market at from $4.20 to $4.50. Admiralty Welsh coal is sold here to contract steamers at $6.60 per ton.

TRANSPORTATION FACILITIES.

No regular steamers from the United States touch at this port.

T. C. JONES, *Consul.*

FUNCHAL, *September 3, 1900.*

MOROCCO.

ENGINES IN USE.[1]

There are no gas engines in use in Morocco, as far as I am able to ascertain. In Tangier, there are two small petroleum engines in use of about 2 horsepower each. There being absolutely no manufactures of any account in Morocco, I see very little possibility of the profitable introduction of gas engines into the country, at present.

FUELS.

As to fuels available, kerosene is imported in considerable quantities in boxes containing 2 tins, of 4 gallons each, varying in price during the past year from $2 to $3 per box. The greater part of this kerosene comes from the United States, principally by way of Germany and Gibraltar. Coal is not largely used in Morocco, and is imported from England. The price at Tangier during the past year has varied from $15 to $18 (Spanish) per ton.

[1] Duty, 10 per cent ad valorem.

TRANSPORTATION FACILITIES.

There is no direct transportation between the United States and Morocco, all American products being introduced through European ports.

S. R. GUMMERÉ, *Consul-General.*

TANGIER, *August 29, 1900.*

SIERRA LEONE.

ENGINES IN USE.

There is no demand for gas engines in this consular district. Such machinery is as yet perhaps several years in advance of the requirements of this coast. Hand machinery engages first attention in Sierra Leone. This is true in every line of business in which power machinery is required, especially in the printing establishments of the colony. This preference is circumstantial, rather than otherwise, and is due largely to the abundant cheap labor which can be utilized for nearly every purpose. Until a change growing out of more progressive conditions supervenes, the demand in West Africa for gas engines and other labor-saving machinery will be limited.

JOHN T. WILLIAMS, *Consul.*

SIERRA LEONE, *October 6, 1900.*

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